# EFFECT OF TECHNOLOGICAL INNOVATION ON NEW PRODUCT DEVELOPMENT

## (A STUDY OF GUINNESS NIGERIA)

**BY**

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**A thesis submitted in partial fulfillment for the MSc in Management**

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## Abstract

The main purpose of the dissertation is to determine the effects of technological innovation on new product development: a case study of Guinness Nigeria. New product development is a competitive advantage resource widely impacted by different strains of technological innovation that this paper aims to establish and analyze. Innovation has become a critical element for many organizations in the brewing industry to sustain competitive advantage more so in today's competitive environment.

A qualitative case study approach is used in this research to study and discuss the critical role of innovation and its impact on new product development in the organization Guinness Nigeria. Data is collected through the use of primary research in the form of a questionnaire to various managers at different levels in the organization. Semi-structured interviews are used to gather information from low-level management employees at Guinness Nigeria. The summary of data collected is integrated to identify and analyze the effects of technological innovation on new product development.

Theoretical data and concepts from existing literature were used in the assessment of the research questions and objectives to provide a rich explanation for the research purpose. The research provides a better understanding of how technological innovation in new product development drives competitive advantage for companies like Guinness Nigeria to survive the increasingly volatile and competitive beer market.

The study highlights the impacts of innovation on strengthening new product development processes undertaken by the case company. The results indicate that technological innovation has direct on new product development and a positive impact on the company's development processes streaming down to the organization's performance. The study results contribute

immensely to existing knowledge of integrating innovation and new product development in the brewing sector. Opportunities for further research are presented including the potential companies forego by assuming innovation in production processes. Other opportunities include the potential to test the implementation of new product development while embracing a hundred percentage innovative technologies in production.

# Submission of Thesis and Dissertation

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***(Thesis/Author Declaration Form)***

**Name: Segun Michael Olajuyigbe**

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**Degree for which thesis is submitted: Masters in Management.**

**Title of Thesis: Effect of Technological Innovation on New Product Development. (A study of Guinness Nigeria).**

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# CHAPTER ONE

# 1.0 INTRODUCTION

## 1.1 Background of the Study

The purpose of this dissertation is to examine how technological innovation affects new product development in the context of Guinness Nigeria located in the southwestern part of the country, precisely Lagos state. For too long a time, the topic of technological innovation has featured dominantly in the studies by scholars in the field of innovative process and product development (Oliveira, Alves and Boer, 2017). The dynamics of innovation within the product development context have been deemed to be extensive thus many study themes that seek to achieve a more in-depth analysis of technological innovation in the new product development context (Chaochotechuang, Daneshgar, and Sindakis, 2015). This research will focus on the themes i) Technological Innovation and New Product Development ii) Organizational performance and competitive advantage to carve out a meaningful discussion from the existing literature.

For companies to prosper and retain long-term competitiveness in the business world today, managers and scholars believe stakeholders must put much effort in the introduction of innovative business operations. Innovative firms adapt to changes better than redundant companies that fail to innovate. It is evident that today, companies ought to spearhead innovation in their corporate strategic plans for a sustainable business model. Such companies produce goods and services that meet the consumers' demand as well as retain their reputation. The market is quickly shifting to market pull strategies from the technology push innovation due to increased demand for better products in all aspects. Now firms must establish fast ways of determining client's requirements and design products that satisfy these needs

(Chaochotechuang, Daneshgar, and Sindakis, 2015). This study focuses on a case study scenario where Guinness Nigeria focuses on Innovation and how it affects the company's product development.

More companies are embracing the manufacture of innovative products. Research and development (R&D) teams in leading entities embrace new product development as a leading contributing factor for improved customer satisfaction. This is made possible through enormous contributions by innovative technology that highly impact the product development output.

To succeed, both small and big firms in the 21st century have learned and recognized the need to integrate innovation and new product manufacturing to remain operationally sustainable ((Lambertini and Mantovani, 2010). It also helps organizations maintain current competencies while exploring new ideas that can improve the process and product development.

Innovation is perceived and recognized extensively as a vital competitive tool adopted within various organs of a business enterprise. On the other hand, it is a complex endeavor considering markets are unclear. Competition is usually intensive and most products have a short lifespan in the market. Therefore, firms get attracted to innovation because it gives many production choices, brings about best performances that earn customer's loyalty, and creates lovely brands. Consequently, most of these companies benefit from the competitive advantage derived from the merits entangled with innovation. Many researchers have dwelled in studying innovation in the past two decades to establish its consequences and relevance on firms' performance. This is because it strategically reveals new methods that eliminate the obstacles that hinder firms from attaining sustainable competitiveness.

Many factors brew trouble for firms when processing new products. Hence it is vital for one to investigate precisely and cautiously the key factors in successful innovation. Scholars and managers are now attentive to information that can describe success through innovation because technological advanced innovation has the potential of creating competitive advantage by developing competitive goods and services, more efficient and effective procedures, or introducing new business ((Misyer, Omar, & Normaziah, 2012). Today firms have renewed ways in which they listen to innovation success goals since the cost of innovation keeps rising, technology gets more complex and the innovation cycle declines. These two camps of researchers are involved in this endeavor. We have a group that describes the external factors surrounding innovation success. They analyze the effects of its network, examine how firms collaborated to develop a new idea since innovation can result from significant input from various partners working together. The next camp focuses on studying internal factors such as performing analysis on an applied strategic plan, corporate culture, technological might, and teamwork. Having output from these camps, it is vital to learn the basics of the impact of their ability. Many scholars have shown innovation success results from roles played by technology applications and treat possession of technological might as a core factor of discovering new might. Firms must also exploit other capabilities like smooth management that utilize efficiency earned from technology machinery to achieve innovation success. Technological Innovation management capacity under managerial capabilities alters this success in a huge way that is capturing the attention of most researchers today. Besides, firms are required to select technology and adapt to new ones continuously. This way, a firm will create new goods and services that satisfy changing customers' needs and grow drastically hence improving its performance. Guinness Nigeria is a high growth supposed to utilize technological innovation to

influence the business success (growth). Factors influencing this success include technology, competitive edge, product research and development, product life-cycle, customer, and market change (Romano, 1990). Organizational performance, technology choice, and technology innovation have a positive guiding interrelationship. Strategic technological innovation is the key factor that drives the process and product development since the majority of the activity is attached to it.

## 1.2 Statement of Problem

New product development is very challenging for most leaders of an organization. Yet, it is the most important element towards surviving competition and remaining strong against competitors when scrambling the emerging markets (Ernst et al., 2015). Studies have shown that fifty percent of projects in the development of new products fail when launched in a new market, thus causing a significant problem to the affected company (Heirati & O'Cass, 2016). The overall challenge in this context is that when a firm fails to develop a new product in a dynamic market, it faces the danger of being wiped out of the global economy. Specifically, the real problem results from a firm leader's incapacity to devise a strategic plan that will bear successful NPD driven by technological innovation. A look at Guinness Nigeria indicates that the company has done less to innovate in terms of modern technology in the brewing sector. The addition of a PET Line is the only noticeable technological advancement effort made way back in 2018. The company has tried to fight off competition to deliver low-cost products that have seen increased demand in Nigeria. Guinness launched the brands to 2019 to venture and penetrate the low-cost consumer market segment with Baileys, Gold, and Orjin Herbal Gin.

A study (Li & Chen 2012) argues that new product development involves the integration of many processes to come up with a final product addressing the idea generation, concept

development (design of prototypes, business analysis and test marketing for potential products), and eventually the successful launch of products. Guinness Nigeria plagued with technological hurdles in the innovation, research, and development of new products. The slow response to market requirements and dynamic consumer preferences has shifted competitive advantage and customer market share to existing and emerging competitors in Nigeria. Most of the problems as concurred by various studies (Lily Julienti & Hartini, 2010) stem from lack of proper leadership, high level of bureaucracy, lack of creativity, inferior idea, and knowledge management. Remarkable changes in the beer industry in Nigeria over the last two decades show heightened competition from new entrances of forceful rivals. The market environment has become very competitive necessitating rebuilding, benchmarking, re-structuring, and strategizing innovation competencies to improve performance.

Managers and scholars view innovation as a basic component that firms use to remain competitive and acquire long-term success in their respective industries. This is simply because innovative organizations can cope and adapt quicker with rapidly changing surrounding safely compared to firms that retain traditional means of operations. Therefore, all firms ought to be innovative and integrate it into their corporate strategic plans. This is critical in developing new products that fulfill customer demands and retain a good reputation in the market. Through such practices, Guinness Nigeria can develop a sustainable competitive advantage against its main rivals. Focusing more on quality products rather than internal efficiency helps as the market gradually shifts from the technological innovation model push to a market-based model. That is why they must hurry to learn to change customers' demands and develop complex goods and services that generate a unique solution for their needs and create superb customer support services (Shepard and Ahmed, 2000).

The relevance of NPD and product innovation as the key driver toward attaining a firm's competitive advantage and economic growth through enhancement of its performance in the market lacks full appreciation in Guinness Nigeria. This paper analyzes a successful product innovation case in Guinness Nigeria. It analyzes it using the proposed case study research format that was conducted via field interviews and surveying using questionnaires to the company's management and other staff close to the related departments. Specifically, the firm's operation involved the manufacturing of packages, equipment, plants, and processes in beer brewing. This study's main focus dwells on the firm's development and the launch of new products that aim to meet the current market demand. Through a presentation of the case study that possesses eminent success, this research paper is instrumental in outlining strengths and weakness experienced in relation to technological innovation and how they affect new product development processes carried out in the firm form idea generation to the commercialization of the new products in the market and purchase of patent. This paper also provides useful results in analyzing how technological innovation affects and guides the new product development process.

## 1.3 Research Objectives and Questions

This research work: ‘The effects of technological innovation on new product development in Guinness Nigeria” investigates how the firm’s technological innovation affects new product development processes. The study also focuses on how innovation may affect the development of product development and the subsequent impact on organization performance as well as Guinness’s competitive strengths. In attaining these objectives, the following research questions will guide the study;

1. To what extend does technological innovation affect new product development?

2. To what extent does leadership affect technological innovation?
3. How do variations incorporate innovation tendencies cause different innovation management impacts on new product development performance?
4. How do industry and corporate statuses impact innovation management new product development performance?
5. Can the presence of Innovative Product Development provide a means of generating sustained competitive advantage?

## 1.4 Research Value/Contribution

This study will contribute significantly to various concepts, studies, and research efforts in the interplay between technological innovation and new product development. There is limited research on how Innovation and New Product Development affect the Nigerian beer (brewing) industry. This study investigates the interplay between the two and provides useful insights for scholars and managers. The research outcome will be useful to government agencies and policymakers who are saddle with the burden of designing suitable, well-designed, and goal-oriented strategies to strengthen brewing companies. The findings made in the study as well help to offer solutions to the research question formulated in this study as comparing and analyzing the findings made in the study will provide empirical justifications or basis for the need to reassess the effect of technological innovations on products development in Guinness Nigeria. Thus, the study will add value to existing knowledge and serve as a reference guide for future researchers and scientists who may wish to launch further research on the same topic.

## 1.5 Research Design and Context

This research will use data gathered using a quantitative approach by employing a survey research design. The data collected is crucial to the researcher in defining, analyzing, and interpreting the effects of technological innovation on new product development of Guinness Nigeria. The research approach and design was favored as it supports the nature of the research problem and satisfies the requirements for determining the relationship between the research variables. Due to the limitation of time, the research design was convenient through an optimized sampling technique taking into account the researcher's easy accessibility and proximity to the subjects of the research. The study examines the data collected through descriptive and inferential analysis. Primary data from the fieldwork/ survey base on the participant responses through the administration of structure questionnaires will be used for the analysis. The study will be confined to the effects of technological innovation on product development using Guinness Nigeria as the case study. This is linked with finding the answers to the research questions formulated in this study as well as the hypothesis tested to find out the effect of technological innovation on product development. The major emphasis and scope of this study are laid on the challenges of technological innovations and new product development in an organization. Ethical considerations will also be taken into consideration to preserve participant privacy/informed consent and ensure the utmost confidentiality.

## 1.6 Structure of the Thesis

**Chapter One: Introduction**

This chapter of the study provides a background to the study as well as the research problem. The research objectives are provided, including five research questions that seek to guide the course of the study, followed by the research value and design.

**Chapter Two: Literature review**

This chapter will review relevant existing literature on technological innovation and new product development as well as the interrelation between the two and how they affect organizational performance. This chapter reviews prevalent studies in the discourse on the concept, as well as a review of the literature on technological innovation, Dynamic Capability theory, and the new product development link.

**Chapter Three: Methodology**

This chapter will address the research design selected, population size, sampling technique, data collection, and analysis methods as well as the ethical considerations that will be applied.

**Chapter Four: Data presentation and Analysis**

This chapter will include an analysis of the primary data collected using the research instrument and the key findings derived from testing the hypotheses.

**Chapter Five: Discussion, Practical implications, and Limitations**

This chapter will provide a discussion of the findings in the research. The discussion will address any possible links in the literature reviewed to determine whether the research objectives and questions were achieved and answered. This chapter will also address the practical implications and limitations of the study.

**Chapter Six: Conclusions and Recommendations**

This chapter will provide a conclusion on the research problem, recommendations as well as suggestions for future research.

# CHAPTER TWO

# 2.0 LITERATURE REVIEW

## 2.1 Introduction

This chapter of the research will examine relevant existing literature on the relationship between technological innovation and new product development. The literature review has been structured in the following sections; the first section covers the conceptual review; the second section covers the theoretical framework on technological innovation and new product development while the third section comprises the empirical review on the relationship between technological innovation and new product development.

## 2.2 Conceptual Review

This segment of the chapter summarizes concepts employed in the report. These include technological innovation, product innovation, competitive advantage, and new product development.

### 2.2.1 Technological Innovation

Innovation is defined as the speed, general research, and development significance that incorporates a compact base of technological science, ability to create new technology that replaces the current one and power to apply it in satisfying the developing and changing marketing market. Innovation has various phases that are evaluated in literature as discussed; management innovation, cultural innovation, market innovation, and technical innovation. The variable affecting a firms' innovation tendency is mainly involves decision-making, senior

leadership in a firm like Guinness, and the support accorded by top tier management towards any efforts involving innovation and product development. Furthermore, industrial and firm variables related to innovation review variables composed of characteristics of the industry, business operation scale, and the technical leadership of a corporate. Additionally, the performance of NPD evaluation includes entry time of the developed new product, quality, the percentage of share it possesses in the market, the rate of success it has in the market, and promotion cost during launching into the market. These are factors visible and applicable by Guinness in its 2019 launch of three new products. The factors interplay to bring success in the development of new products to accommodate the dynamic consumer preferences and shifts in market segments towards certain products. Innovation is seen as a success factor for businesses and an element for understanding what customers want and their satisfaction (Reguia, 2014). Innovation is described as a driving force behind today's many successful businesses (Dereli, 2015). Over time, studies have shown that innovations play significant roles in the development of new products. For instance, it is having been argued for products development to strive in any dynamic business environment, innovations must play a central role (Chaochote, Chuang, Daneshgar, and Sindakis,2011; Badawy,2011). Our case study recognizes that Guinness Nigeria faced stiff competition and market penetration challenges prior to the 2019 innovative product development. The introduction of low-cost consumer products and new brands into the market that diversified customer options are among the innovative processes and new product development efforts that improved the company’s performance in Nigeria. The company reported a fifteen percentage annual growth in sales in the year.

### 2.2.2 New Product Development

Product development is described as the collection of activities beginning with both the perception of a market opportunity and ending with the manufacture, sale, and delivery of a product (Beauregard et al., 2016). New product development evolution and innovations, therefore, include new manufacturing techniques in the approaches of processing.

Also, product innovations reflect the image of the company, and the company's overall success depends on the success of the product by fulfilling the needs and desires of consumers through the development of new. This is due to the act that in recent times the quality of product development by any organization offers the opportunity to build more on the brand image of the company. Organizations that developed successful products that met the needs and expectations of the customers always stand in the pathway to being a leader in the industry.

Therefore, in linking innovations to product development, it is important to identify the role technology plays towards product development and the factors affecting technological innovations. For example, Bilgili et al. (2011) described the factors that affect the development of new goods which include rapid growth and technological development, improved marketing environment, and competition. The three dimensions of new product development (NPD) and R&D programs are innovation (incremental-radical), technology (low-high), and market (new-existing). Identifying the dimensions of new product development and research and development will help organizations especially Guinness Plc to innovate and develop new products or improve on existing product brands as this will help their products compete more in a changing business world.

Albers et al. (2016) also talk about a fourth dimension, called the industry's nature. Many studies suggest, according to Hu & Aziz (2016), different types of theoretical frameworks for the process of new product development. These include testing proposals, initial product releases, company, or technological evaluations (Hu & Aziz, 2016). To design and develop a product, the concentration on the later stages of new product development is suggested (Hu & Aziz, 2016). Hu & Aziz (2016) also states that a large amount of information and knowledge is needed for modern product development. NPD is a progressively utilized term in new research by Bilgili et al. (2011); Woschke and Haase (2016).

Drivers of development incorporate the size of the association, open advancement practices, the nation of beginning, interest in R&D, hierarchical culture (Tellis,2013). It has been derived (Damanpour,1992) that ranked size is identified with the usage parts of developments as opposed to the commencements of advancements in associations. The perfect culture of advancement would incorporate the eagerness to tear apart existing product, adjusted promoting, and innovation ideation, explicit time spent on inventive action, grasp hazard and spotlight on the future; pioneers of enhancing firm need to guarantee that these social qualities rise through fitting motivations, strengthening of trailblazers and support of inside business sectors (Tellis,2013).

Kotler and Armstrong, (2010), opined that all together for any organization to develop new products, it must comprehend its buyers, markets, convey better an incentive than clients. Moreover, it must do solid new-product arranging and set up a deliberate new product improvement process for finding and developing new products. The significant eight phases in new-products advancement are thought age; thought screening, idea improvement, and testing;

promoting procedure advancement; business examination, item advancement; test showcasing, and commercialization.

Furthermore, another reason for product development is the propensity of clients to benefit from new advancements on new items which specialists guarantee to give new highlights or capacities. Products whose development is made by joining innovation and client criticism or viewpoints undoubtedly have the most up to date innovation and thus acquaint new quality and focal points with meet client's wants (Cooper and Edgett,2009).

### 2.2.3 Product Innovation

Product innovation is widely referenced in the literature (Avermaete, 2003; Lee, Wu, and Pao, 2014) and as a measure of product innovation. Christofi, Vrontis, and Leonidou (2014) define product innovation an integration of both continuous and cross-functional processes. The processes examine innovation through various competencies within an organization. New product development is intertwined with innovation to enable businesses to transfigure potential opportunities into viable products in the market. Guinness Nigeria is a good example of a company that has faced product innovation hurdles until competition forced it to review its research and development initiatives. Mei-Chih and Mathews (2009) indicate in their study that product innovation performance is measured by patent grants, licensing revenues, the use of product-based goals, and process-based goals (Nee, Kang, & Opper, 2010), as well as quality control.

Product innovation performance (PIP) indicators are used to measure the failure or the success of product innovation. It represents the economic, financial, and non-financial outcomes of a

company’s innovation efforts through measures of performance widely recognized in the literature (Löfsten, 2014) such as profitability and growth of sales.

#### *2.2.3.1 Classification of Technological Innovation*.

Innovation plays a key role in the highly competitive global market (Badawy,2011), is correlated with the success of the organization in terms of sales and growth, and is seen as an aspect of the competitive advantage strategy of the businesses (Thornhill, 2006, Carbone, 2011). Based on their innovation work in several countries, the OECD (2005, 2009) has drawn up a list of types of innovation commonly referred to in the current literature which divides innovation into two main categories: (1) technological innovation and (2) non-technical innovation.

Similarly, under non-technological innovation, two forms of innovation exist, namely marketing innovation and organizational innovation. The current study focuses on product innovation that is a type of technological innovation as product innovation plays an important role in enhancing the quality of life and boosting the financial and marking efficiency of a business (Hoonsopon and Ruenrom, 2012). "Extreme product innovation" and "incremental product innovation" are the most widely used forms of product innovation (Atuahene-Gima,2005, Hoonsopon, and Ruenrom, 2012).

Radical innovation is generally characterized by two distinct perspectives: (1) the consumer perspective; and (2) the technical perspective. Radical product innovation's business perspective refers to the extent to which the influence of that innovation has on the consumer (O'Connor and DeMartino, 2006, Groenewegen and de Lagen, 2012). Radical innovation has such an impact on the consumer that it makes the current goods redundant or unnecessary and may even threaten to

kill the existing industry (O'Sullivan and Dooley, 2008), and may even generate new industries (Schoenmakers and Duysters, 2010). For example, existing and emerging competition from competitors such as Nigerian Breweries, Brooklyn Brewery, and Deschutes Brewery in the beer industry have radically challenged the industry and affected how NDP radically changed a market. The radical innovation has pushed some companies out of the market or being redundant for example Pabod breweries. It has also challenged others such as Bature and Consolidated Breweries among others to look into their production processes and improve on the different brands of products they are bringing into the marketplace.

## 2.2.4 Organization Profile: Guinness Nigeria

A brief introduction to the organization interviewed and an overview of their products and work is made available as discussed below.

### *2.2.4.1 Description.*

Guinness Nigeria Plc is a public limited liability company. It is listed on the Nigerian Stock Exchange and incorporated on 29 April 1950 as a trading company importing Guinness Stout from Dublin. The Company has ventured into manufacturing operations and its principal activities include brewing, packaging, marketing, and selling of Guinness products.

### *2.2.4.2 History*

The Guinness products were distributed in Nigeria in the 1940s and 1950s by United Africa Corporation (UAC) and soon became a significant export market for the brand. In 1961, arrangements were placed in motion between Arthur Guinness Son and Co and UAC to build a brewery in Ikeja, Lagos. The first factory in Arthur Guinness outside the British Isles was

established by Taylor Woodrow. The original plant had an annual output of 75 million bottles or 150,000 barrels of beer. The plant region had a 15 million bottle bin size and an office block constructed by Godwin and Hopwood (Guinness in Nigeria,1963). In 1962, Guinness Nigeria, an affiliate of Diageo Plc of the United Kingdom, was integrated into the building of a brewery in Ikeja, in the south of Lagos. The brewery became the first Guinness operation outside of Ireland and Great Britain. Several breweries have been established over time: the Benin City Brasserie in 1973 and the Ogba Brasserie in 1963.

### *2.2.4.3 Products*

Foreign Extra Stout, Guinness Extra Smooth, Malta Guinness, Malta Guinness Herbs Lite, Harp Lager, Smirnoff Ice, Satzenbrau Lager, Dubic Malt, Snapp, Master's Choice, Orijin Spirit Mixed Drink, Orijin Bitters, Smirnoff Ice Double Black with Guarana, Guinness Africa Special, Orijin Zero, Tappers, and Royal Kingdom Lager.

To be specific Guinness Nigeria manufactures the following beer brands: Foreign Extra Stout (1962), 7.5% ABV (varies), Harp Lager Beer (1974), 5.15% ABV, Guinness Extra Smooth (2005) 6% ABV, Satzenbrau (November 2006), Harp Lime (2012) – discontinued. Armstrong Black Lager – discontinued Dubic Extra Lager (April 2012) 5% ABV, The RTD (ready-to-drink) products include Gordon's Spark (2001) – discontinued, Smirnoff Ice (September 2006)5.5% ABV, SNAPP (September 2012) 5% ABV, Orijin (August 2013) 6%ABV] (Guinness Nigeria Launched, 2014). The popular Malta (soft drink) drink range includes Malta Guinness (1990), Malta Guinness Low Sugar (May 2012) ("New Malta Guinness, 2014).

### *2.2.4.4 Competition*

Competition is a major factor affecting all the brewers across the board regardless of size, age, distribution, and reputation. The competition involves many inputs from different sectors. For instance, apart from competing only with rival beer producers, the industry has stiff rivalry from other companies that make different kinds of drinks that substitute beer consumptions and offers. Therefore, these producers need to study the concept of competitive advantage to understand the best means to capture the opportunities in the emerging markets. Countrywide competitiveness relies on production levels that depend on national policies, environmental factors, and institutions. However, it is clear that this notion does not associate competitive advantage with market developments to reflect that when a market matures, the companies must adjust their strategy to remain relevant and achieve a competitive advantage.

### *2.2.4.5 A Case Analysis of Guinness Nigeria*

The image of the beer industry in Nigeria has been transformed and rocked by the growth of craft beer. People are changing their negative perceptions towards small scale brewers. Initially, they believed that small brewers operated in pubs only since they sell dark beer with overloaded flavors. There is so much potential in this brewery industry that was revealed lately by using new creative techniques and genius decisions made by brewers such as Guinness when marketing their products. Many wonder whether the beer industry can sustain its competitive advantage, considering that the industry has developed virtually from nothing to something over time. There have been many uncertainties in the beer market associated with the high number of brewers who create stiff competition and the potent in the niche market. The phrase competitive advantage is undergoing increasing scrutiny based on its relevance in the current market. Although a significant number of questions, its applicability, the competitive advantage remains

a critical concept that explains the industrial evolution and movement. Many large firms from all parts of the world have tested their framework regularly. Lumpkin and Dess (1996) in their suggestion, push for cooperation to consider the two-point of view of process and product simultaneously to define innovation activity and make integration of both results and process. Innovation activity should focus on implications from technology and management because it consists of technological innovation inside equipment, process, and product.

One sure way to evaluate the effect of innovation on the market is by assessing the degree of consumer value the invention has over existing goods. On the other hand, revolutionary product innovation's development viewpoint applies to the degree to which the development varies from current technology (Schoenmakers and Duysters, 2010). Extreme innovation is characterized by technology that varies greatly from current technology and can build new technical structures (Schoenmakers and Duysters, 2010). Because the latest technology is so different from the current technology, the technology is often called discontinuity (Abetti, 2000, Herrmann et al., 2007).

In applying this to Guinness Nigeria ever since their introduction of products such as Foreign Extra Stout (1962), 7.5% ABV (varies), Harp Lager Beer (1974), 5.15% ABV, Guinness Extra Smooth (2005) 6% ABV, Satzenbrau (November 2006), Harp Lime (2012) – discontinued. Armstrong Black Lager – discontinued Dubic Extra Lager (April 2012) 5% ABV. The RTD (ready-to-drink) products include Gordon's Spark (2001) – discontinued, Smirnoff Ice (September 2006)5.5% ABV, SNAPP (September 2012) 5% ABV, Orijin (August 2013) 6%ABV] (Guinness Nigeria Launched, 2014). The popular Malta (soft drink) drink range includes Malta Guinness (1990), Malta Guinness Low Sugar (May 2012) ("New Malta Guinness, 2014). The company has not been able to adapt to the changing nature and needs of the people.

Their inability to developed more products has led to switching to some of the other brands of products not from the company. Guinness Nigeria had not radically transformed its NDP and they were lagging with respect to the development of new products.

There are several definitions for incremental product development, but they generally refer to minor changes in the product or technology with limited impact on the technological system and low incremental customer benefits that distinguish it from radical innovation (Schoenmakers and Duysters,2010). Most of the innovations are incremental innovations and are the main sources of productivity growth (Schoenmakers and Duysters,2010). Incremental innovations use less effort and resources, are less ambitious in scope, are less risky, and generally more successful than radical innovation (Zakic et al., 2008). For instance, over time the Guinness Nigeria Plc has had incremental innovations towards achieving some product brands over the years even though there is more opportunity to develop more products in a radical way.

On the other hand, incremental innovations tend to have lower impacts on growth (O'Sullivan and Dooley, 2008). Many manufacturing companies rely entirely on continuous improvement and use techniques such as "Complete Quality Management," "Lean Manufacturing" and "Continuous Improvement" to bring certain small changes to the enterprise (O'Sullivan and Dooley, 2008). According to Slater, Jakki & Sengupta (2014), they argued that innovative firms typically have a few radical innovations and several incremental innovations during the same planning period. The present study does not distinguish between radical and incremental product innovation. This is due to the fact that in Nigeria, today, radical innovations across different sectors and industries have varying challenges which will take several decades to achieve. Also, in most organizations, they have not even wittiness incremental innovations for years in their existence.

The progress of manufacturing the technology, quick dynamics of the company's business surroundings, and shortened life cycle of a product will eventually force Guinness Nigeria to put more effort into developing more innovative technology so that it can meet the rising demand from the customer and attain the performance requirements of new products. This study has examined several factors doing a series of activities in the management of innovation, then determining and analysing results from the influence of such activity to the new product. The paper considers two variables for the tendency to innovate and corporate status when describing the connection between NPD and innovation management. Formerly, it was owned by the factor if influence for the outer strategy. The latter has a relationship with the firm's interior. This research paper intended to place its focus on the management of innovation for Guinness Nigeria since the Nigerian brewing sector is making a gradual entrance to the age in which the competitive advantage of a firm is determined by the level of technological innovativeness and competence. This argument brings academic and practical meaning. The research has also made the following findings:

1. NPD performance has significant contribution during mighty management of innovation are put in place
2. NPD performance contribute a significant input when there is High tendency to innovate
3. Innovation performance contributes significantly to New Product Development

### 2.2.5 Innovation and Corporate Development

The challenge of developing new goods should not be the responsibility of a single department alone (Ulrich and Eppinger, 1995; Dovey and White, 2005). It ought to be the absolute initiative of the organization. Strong management resources must be given for any product development project to be effective. New products continue to interrupt old habits that managers of well-

established goods sometimes try to maintain in a subtle way. Thus, someone with the greatest level of support and the power to do things needs to be responsible for developing new goods. Product development is guided by market needs. The majority of new product ideas emerge from scientific discoveries and new technologies. As a consequence, Guinness Nigeria ought to appoint experts to research the technical landscape in search of new ways to meet the needs of consumers.

The economic success of a business is dependent on its ability to identify the desires of its consumers and to quickly develop solutions to satisfy them. Marketing thus enables the recognition of the customer's needs (Iwu,2010). Successful product production necessitates goods that are produced and profitably marketed, which do not automatically need to be pushed forward because the advantages of product success cannot be instantly measured in terms of monetary interest or metric. In this context, the quality of any new product development will be judged based on the following vector parameters as noted (Iwu,2010).

**Product Quality:**

Product quality: Tests the good level of the product on the grounds of development effort, customer satisfaction, robustness, and durability of the product to be adequate to gain market share and still be competitive for customers to pay for it (Iwu 2010).

**Product Cost** deals with the cost of producing a product or providing a service, such as capital and toll costs, as well as the unit cost of production of each product. Essentially, it provides an estimated or forecast profit on sales or service offerings to potential customers at a specific price (Iwu,2010).

**Product Expense:**

That deals with the expense of manufacturing the goods or delivering the operation, such as the cost of operating equipment and tools, as well as the total cost of the output of each company. Essentially, it offers an actual or expected return on product or service products to prospective consumers at a fixed price (Iwu,2010).

**Development Time:**

This explains the degree to which the project integrates resources to complete the development of new goods. It also makes use of the company's exposure to competitiveness in its market and its degree of technological development in a timely manner, in order to receive economic returns in the attempt to pay the team (Iwu,2010).

**Development Cost.**

It informs us about the sum of money needed to produce the drug, which should be adequate to create the new goods, as the production expense is a part of the profit-generating contribution of the new products (Iwu,2010).

**Development Capability**

In the light of fast-moving market changes and a growing trajectory in technological innovation, the company's management capability needs to be measured to assess whether the team is capable of implementing and delivering a future product development project. This is known to be a potential tool that companies can use to develop new technologies more efficiently and successfully to ensure constant improvement and improvements in their business growth (Iwu,2010).

### 2.2.6 Determinants of Successful Product Innovation Development

Substantial activities are summed up as variables or characteristics that define successful product ideas that businesses are innovating; and allowing them to support corporations mitigate or eliminate threats to company ventures, especially those including the production of innovative goods. According to Cooper (1999), these seven activities have been established as seven essential success factors that define the efficiency of product innovation (Pitta, 2008), summarized as follows:

**History up-front viability**: The task of defining the object of interest is to describe whether and how it needs to be created and to explain its production by its degree of content or meaning (Pitta, 2008).

**Seek Consumer Feedback**: It is important to analyze the target market of the company in such a manner that the need and appeal of the potential goods will be accepted or suit into the markets. The firm should also be active in consulting customers to provide feedback in the production process of the goods, especially those without technical sophistication (Pitta, 2008).

**Development of product positioning**: The production of innovative goods will be successful enough to provide consumers with superior value in such a way that their features are exclusive, rendering them distinct from all similar products on the market (Pitta, 2008). The purpose of product advancement is then to establish a clear comparative edge and market place for innovative goods, which must, of course, be desirable in order to meet the requirements of the customer and in which must always be most advantageous in order to meet the needs of the consumer.

**Early Development of Easy and Stable Model**: The design of the goods will be created in its nature so that it does not cost so much, because it is not only original, just a test. Some businesses seem to spend needless capital, design activities, and time to make something appear original (Pitta, 2008). As a consequence, it results in a loss of money, e.g. in development or in dynamic product design.

## 2.3 Theoretical Review: Dynamic Capability Innovation Theory

The importance of dynamic capability innovation theory to the effect of technological innovation on new product development can never be overemphasized. To address the failure of resource-based theory, the principle of dynamic capability innovation has been incorporated alongside the principle of organizational reinforcement (Bardhan,2007). This is because managers especially Guinness Nigeria Plc need to continuously change resource and capability provisions within the organization to respond to the business environment. Dynamic capabilities are characterized as the company's capacity to incorporate, develop, and reconfigure internal and external competencies to meet rapidly changing environments (Akkermans, H. & Renga,2001).

"Dynamic capabilities consequently represent the capacity of the firms especially Guinness plc to gain different and inventive ways of competitive advantage in terms of path-dependence and market situations"(Teece et al, 1997). Furthermore, the theory is important to this study as superior corporate success is not attributed to dynamic capabilities as such, but resource allocations arising from the usage of dynamic capabilities (Lin,2003). Dynamic capabilities are therefore essential, but not adequate for competitive advantage and organizations especially Guinness Nigeria plc has to differentiate between dynamic capabilities and their outcomes (Eisenhardt & Martin,2000).

In fact, in the sense of volatile markets in hi-tech industries, a resource-based approach has developed a complex framework that reflects on the skills that a company will acquire to strategy volatility and maintain a competitive edge (Lundvall,2010). Firms, therefore, need to have a diverse capacity to predict these changes by incorporating, constructing, and reconfiguring internal and external competencies to meet a rapidly changing environment. In addition,

Schoonhoven & Cua (2001) claimed that the company's finances are a fundamental basis for creativity. That is, how the competitive advantage within the company is gained and how this benefit can be maintained over time (Nonaka,1994).

In this background, companies are hypothesized as a pool of resources that are heterogeneously spreading across the business and where disparities in resources exist over time. Nevertheless, where corporations have advantages that are unique, uncommon, difficult to replicate, and substitutable, they may adopt value-added techniques that avoid imitation by other firms and therefore, create a competitive edge for product innovation. Overall, the dynamic capability theory is chosen as the theoretical paradigm in which this analysis is focused on. The basis that the theory reflects on the company's need to integrate, construct, and reconfigure internal and external competencies to meet increasingly evolving environments are important to this study. "Dynamic skills, therefore, represent the capacity of the enterprise to gain different creative ways of competitive advantage based on the direction of dependency and market place" (Teece et al, 1997).

## 2.4 Empirical Review

In this section of the literature review, it forms the basis to which this study is been done. There is limited literature focusing on the effect of technological innovations on new product development in the breweries and other bottling companies in Nigeria.

Several researchers over time have made significant efforts to evaluate the impact of technological innovation on new product development. The sample was deliberately chosen from the SMEs organizations registry and directories which consisted of 100 small medium-sized enterprises engaged in industrial activities with fewer than 300 employees. The study data were obtained by questionnaire and schedule of interviews with a group of 100 small and medium-sized manufacturing companies. The results revealed that among these companies, the key sources of information for innovation were customers; equipment and machinery suppliers; seminars, training, and conferences; market research, and business organizations. The study concluded that contact with vendors, consumers, public institutions, and business organizations would provide necessary insights into the learning process that could not be easily given by the organization. This study, therefore, offers a gap to the current study as there are several challenges identified in this study which Guinness plc and other breweries firms in Nigeria lack. Such issues undermine the success of technological innovation and its effect on product development.

In a similar study, Eneji, Nnandy, Gukat, and Odey (2018) estimated the effect of technology innovation on sustainable entrepreneurship development in Nigeria. A survey questionnaire was used in the analysis with sampled stakeholders in Central Nigeria. This demonstrates that the adoption and mastering of technologies in Nigeria need more than importation. There has been a

shortage of impressive attempts to establish innovative technologies. The assessment of the results was carried out using a basic percentage statistical methodology. The degree of technological advancement in Nigeria is small and entrepreneurship is high. This is attributed to fiscal, financial, socio-cultural, and environmental factors as identified by the researchers. The multiple regression techniques are conducted using secondary evidence. The result indicates that the diffusion of indigenous technology would have a pervasive, but distinct, effect on Nigeria's entrepreneurship across the agriculture, manufacturing, and service sectors, including telecommunications. The education and private sectors in Nigeria will play a leading role in the incubation, invention, introduction, and transition of indigenous technology. It is concluded that innovation and entrepreneurship will improve jobs in Nigeria. Nonetheless, the structural environment and the capacity to promote creativity are poor. Nigeria requires to establish a coherent national strategy for research, technology, and innovation through professional education and training.

Furthermore, Oyewale, Adeyemo, and Ogunleye (2013) identified technological innovation as an essential tool for the development of entrepreneurship in Nigeria. Technology advancement in the form of internet connectivity, telephone (mainlines and mobile), business access to websites, and population growth was defined as a research gap and problem solved and used as proxy variables for their websites. Entrepreneurs and population growth were defined as a research challenge and problem solved and used for their study as proxy variables. To pick a total of 12 entrepreneurs from Lagos State who constituted our sample size, a simple random sampling technique was used. The report used the questionnaire as a research tool. Using regression analysis, the collected data are analyzed. The results showed that a significant relationship exists in Nigeria between technological innovation and the growth of entrepreneurship. Therefore, it is

recommended that the government create a favorable or encouraging atmosphere for entrepreneurship and consumer goods to boost the economy in Nigeria.

Also, Onu, Olabode, and Fakunmoju (2015) conducted research to determine the effect of IT expenditure on the production quality of the employee. The study subject consisted of seventy sachet and table water manufacturing employees, Lagos, Nigeria. Style of management, technical expenditure, the performance of employees was used as proxy variables, survey development data for the analysis survey plan information for the investigation was gathered through a well-organized questionnaire conveyed to the laborers of the sachet and table water organizations. f- test, t-test, regression, and correlation investigation was utilized as a technique for information examination. The findings of the investigation indicated that there exists a solid positive relationship and critical impact between total yield, innovation use, workplace, and the board style and that the mechanical utilization underway procedures have the most noteworthy commitment to support total yield execution of representatives in sachet and table water fabricating organizations. From the outcome, it very well may be derived that the administration style decides its utilization. The vast majority of the respondents conceded to the declaration that the old-style the executive's style decides returns of IT utilization in the assembling firms.

From the findings made, the growth of information technology (IT) has contributed to concern in exploring the role of IT in the production of new goods (NPD). IT or technological innovations has been used to promote the development of ideas and product research, as well as NPD tasks such as workflow and portfolio management. However, new work shows that there is a difference in the quality and utilization of Information. Given the role of IT in generating market interest through the creation of innovative goods and services, the present study aims to

recognize variables that have an effect on the usage of IT. In addition, anecdotal evidence and empirical studies indicate that the usage of NPD IT tools can shorten time on the market.

In the same way, Nazila, Gholamhossein, Hamida, and Mina (2017) examined the new product development in the pharmaceutical firms: Evidence from a conventional market. The examination distinguishes basic achievement elements of NPD dependent on the important writing and master conclusions in the Iranian pharmaceutical industry, at that point organizes them utilizing the procedure of numerous criteria basic leadership (MCDM) through investigating 50 filled polls organized dependent on the AHP (Analytical Hierarchy Process) approach. In spite of the fact that the NPD achievement factors appear the equivalent in both conventional and bio-nonexclusive pharmaceutical ventures, the fundamental factors and related sub-factors show the distinctive significance in these two enterprises. In any case, this examination uncovers that the "company capabilities" is the most significant factor influencing new item advancement accomplishment in both the pharmaceutical nonexclusive and bio-conventional industry.

Arkadiusz (2017) examined the imaginative business in Poland against European nations. The examination tended to an inquiry with respect to the range and degree of the inventive enterprise of Polish organizations in contrast with other European nations. Inner R and D exercises, cost decrease, giving most assets to development, creative exercises compared with the interest of inventive organizations as key intermediary factors utilized. The information utilized in the observational part has been gotten from both Eurostat information and possesses reviews. The investigation led electronically on a delegate test of 455 organizations in the second 50% of 2016. Meetings were utilized as an information instrument; the examination received a verifiable methodology as a factual strategy. The consequences of the examination show the explanations

behind SME SR's low development action, just as the reasons for SME's low enthusiasm to utilize the analyzed budgetary instruments of ingenuity support from the state. The low proficiency of the inspected types of money related help of SME advancement from the state is distinguished, which is because of low mindfulness particularly of start-up SME, the little volume of chose finances that just mostly spread the genuine expenses of SME for the improvement of development. Such issues incorporate the wasteful interruption of assets chose for this reason and the nonattendance of input on the viability of their utilization.

Shengbin and Bo-Yu (2011) examined the effect of an organization's innovation determination on its development achievement and authoritative execution. The mechanical ability empowers an organization to increase the value of items and procedures, and its effect on development achievement has been analyzed. The model is experimentally tried utilizing the information of 120 Chinese organizations gained by meetings and studies. Relapse examination was utilized as a technique for information investigation; the outcomes show that an organization's innovation choice has no immediate effect on advancement achievement; innovation determination has a noteworthy positive effect on mechanical ability and innovation the executives capacity, which, thusly, have a critical positive effect on development achievement; development achievement has a hugely positive effect on authoritative execution.

Serdar and Gloria (2010) analyzed how data innovation (IT) influences new product adequacy. Using the post-survey approach, the research utilizes data from a selection of the representatives of the Product Creation & Management Organization to analyze the influence of project harm, the presence of a leader, flexibility, creative environment, IT technology, and IT convergence on the level of IT use. Such data are often used to analyze the effect of IT use on business pace and market efficiency. The findings suggest that the vulnerability of the initiative, the presence of a

leader, and the convergence have a significant effect on the degree of IT use for new product development. The application of IT has a strong and important effect on the success of the latest product on the market. Ironically, and counter to common opinion, the use of IT has little effect on the development of the business. A significant consequence of this study is that the usage of IT affects efficiency, but not the way managers anticipate it. Furthermore, the application of IT does not appear to hinder the development of the business but instead has a beneficial effect on the success of the latest product on the market. This finding shows that the use of IT in NPD brings companies much more interest than commonly believed, which offers reasons to encourage stronger involvement in IT for product marketing activities. The consequences of the analysis are that when IT is incorporated into the product development cycle and advocates for IT solutions remain, the odds are that IT will not be implemented and the advantages will not be understood.

From the different viewpoints on technological innovation and the development of new technologies remain technically as well as an empirically unresolved issue. The effect of the reviews is that there is no definitive consensus between researchers on the nature of the partnership between technological innovations and the development of new products; this could present a major challenge for decision-making among policymakers.

However, observational data and analytical findings indicate that the usage of new product development IT software will reduce time on the project, boost product efficiency, and maximize profitability. Nevertheless, the empiric nature of this effect is largely non-existent. For instance, this result is similar to the work of Nazila, Gholamhossein, Hamida, and Mina (2017), Eneji, Nnandy, Gukat and Odey (2018), Oyewale, Adeyemo and Ogunleye (2013), and Onu, Olabode, and Fakunmoju (2015) all identify the role technological innovations play in the success of

different organizations. They also identified various challenges and apply different estimation techniques as well as bring different submissions and recommendations. These approaches adopted by these researchers, therefore, will be used as a basis of compression with previous studies against the findings that will emanate from this study.

## 2.5 Conclusion: Summary of Gaps

The concept of technological innovation and product development has been studied with varying definitions and analysis of how the two relate. This paper reviews innovation and new product development as a cross-functional process. The analysis made indicates that organizational strategies and objectives can differ or originate from multiple functional areas of the business. I have reviewed extant literature concerning innovation and new product development which is a long term process whose decisions are real-time to facilitate decision making and other dynamic adjustments to operations and performance as well.

The literature reviewed on product innovation, strategies, and product development process draws the following conclusions. The review and analysis suggest that product innovation is crucial to the performance of any firm more so the one in our study. Secondly, innovation strategies adopted by firms have improved and worked hand in hand with product development towards positive results and performance. Lastly, product development and innovation are integrated into overall organizational activities which facilitate new technology paradigms that have become part of the product development and innovative lifecycle management. The future stands bright for entities utilizing big product data and digital infrastructures. The integration of product development and innovation seizes the digital opportunity to define long-term strategies that leverage digital enablers in aligning organizational strategies with corporate vision and goal. Specifically, the research questions critical to this research include;

1. To what extend does technological innovation affect new product development?
2. To what extent does leadership affect technological innovation?
3. How do variations incorporate innovation tendencies cause different innovation management impacts on new product development performance?
4. How do industry and corporate statuses impact innovation management new product development performance?
5. Can the presence of Innovative Product Development provide a means of generating sustained competitive advantage?

# CHAPTER THREE

# 3.0 METHODOLOGY

## 3.1 Introduction

This section of the study presents the methodological tools and research methods employed in achieving the research objectives and test our hypothesis. In this chapter, the researcher will identify and where possible develop rationale for decisions made in relation to the research design, research philosophy, population of the study, sample size and sampling procedures, operationalization and measurement of variables, method of data analysis, limitations of the study and ethical considerations

## 3.2 Research Philosophy

Research philosophy is defined as the assumptions and belief systems about knowledge development (Saunders and Thornbill, 2009, pp. 130). The assumptions involved in a particular research philosophy play a pivotal role in choosing a given methodology, research approach and data collection, data analysis, and relevant measures of interpretations. It is vital to emphasize the use of a philosophical outline to reinforce all research studies concerning both ontological and epistemological points of view (Quinlan, Griffin, Carr and Zikmund, 2019). Therefore, this study has applied positivism are defined by the nature of this research as the philosophical framework. Epistemological debates involving sociologists brought them to different schools of thought when describing knowledge, development, and studies. Based on these epistemological debates, the discussions are dominated by two sets of schools of thought. These are interpretivism, constructivism, and positivism. Although epistemological debates believe that man's behavior

flows definitely and consistently, they use contrasting positions in describing social reality. Positivism argues that one can study social existence and human behavior objectively via observations, which leads to the "laws of cause and effect" that control general human activity. Furthermore, they are revealed by quantitative processes that describe the social outcomes and variables shapes. Interpretivism-constructivists deny that social realities are defined by observation of human conduct.

Given that the main research problem is to investigate the impact of technological innovation on new product development, a positivist philosophical framework was chosen as a majority of the research elements fit within the framework. The research also employs quantitative methods to test the hypotheses developed as well as investigate the relationship and interaction between the variables of technological innovation and new product development.

## 3.3 Research Approach

Any research can use the following three approaches; qualitative, quantitative, and mixed-method. Both philosophical background and research problems influence the choice of approach the researcher will achieve to attain his or her objectives. The ontological and epistemological perspectives of a positivist paradigm are used to guide methodology selection. The main aim here is to allow the researcher's objectivity; by developing a justified hypothesis, free form bias with an ability to examine the factors that connect variables. People's assessment of technological innovations and product development tends to be multifaceted, consequently, the investigator selected the survey approach, a subcategory of the mixed methods. This implies that the study primarily developed one procedure to collect data, as there remained limitations in replies from this technique an alternate method of analysis was chosen and phased into. The

study's all-encompassing method is to examine the effect and drives behind firms that provide technological innovations and apply them to new product development.

## 3.4 Research Design: Survey design

In this chapter of the study, the procedural guidelines underpinning the research design are discussed. The researcher begins with a discussion of the stance from which this inquiry was approached. The practicalities and principles of the course chosen to gather analyses and present this research are considered. It is then concluded by reflecting upon the possible limitations and methodological challenges of the study design. The following subsection, therefore, describes the procedure and estimation techniques to be used in the conduct of this research. The measurement of the effect of technological innovations on new product development is presented in the questionnaire section below.

### 3.4.1 The Role of Cross-Sectional Survey in Determining the Impact of Technology on NPD

The study adopts a cross-sectional survey to analyze the objectives which are to identify the challenges of technological innovations on new product development in Guinness Nigeria and evaluate the impact of technology innovation on the quality of new product development in Guinness Nigeria.

The fieldwork is conducted via email because of distance and funding constraints limiting the survey being carried out face to face. Also, the fact that the survey does not require a face to face meeting and technology offers the ability to be able to conduct this fieldwork with ease over long distances. This as well used digital modes because the country industries and organization is shut down due to Coronavirus pandemic ravaging the globe in recent time.

The importance of the survey is that it offers the analyst the chance to test the respondents' views on the challenges of technological innovations to new product development and the effect of technological innovation on new product development in an organization. The study technique is fit for gathering information from countless respondents and gives the research enough chance to pose various inquiries about a subject, giving broad adaptability in information examination.

The limited-time and non-existent funding the researcher had to conduct this study meant it would have been impossible to visit these locations and obtain the information firsthand. The Interview consists of 15 items variables used to capture challenges of technological innovation to new product development and the effect of technological innovation on product development. This was tested using the pilot survey test to determine the validity and reliability of the questionnaire. A large number of participants in the organizations were reached out to by email.

Apart from being an effective methodology, the survey design opted in cross-sectional studies was economical in collecting sufficient data from a large sample population and hence the best choice.

## 3.5 Population and Sampling Methods

### 3.5.1 Population Size

Essentially, any research population would include all employees of the concerned entity in the various departments applicable in relation to the study. The population of this study would consist of the members of staff of Guinness Nigeria which consist of 1332 members of staff (Human Resource Department of Guinness Nigeria, 2018).

The population helps to gain insight and knowledge into the technological innovation and product development of the organization and how they go about it. It as well as offers the researcher idea of the sample to be drawn from the targeted population for empirical analysis. The investigator expected these surveys would reveal whether the firm is conscious of the potential that they could be promoting towards the advancement of organizational product development. The researcher also thought this survey would test the study theory and optimistically shed attention on the constructive actions of these organizations.

### 3.5.2 Sample Size Determination

The sample size is crucial in selecting a representation of the entire population as it is nearly impossible to gather feedback from all employees. The process is simplified and becomes more convenient and economical for the researcher. To derive the sample size, this study employed the Taro Yamane technique to evaluate the sample size because the technique provides a more representative sample from a given population set with correct sample size estimates for the large sample size. This is because the Taro Yamane sample size calculation uses a scientific method of arriving at a well-represented sample for analysis. The sample size determination using this technique plays a vital role in this research since it makes use of survey data in seeking responses from the questionnaire it is useful to get a represented sample size from the population.

Also, to be able to get a good sample for Guinness Nigeria members of staff and management for this analysis it is important to not guess or use sample size calculation that cannot be verifiable as it will affect the overall outcomes and policy to be recommended in this study.

According to Asika (2012) well-defined a sample as exactly a portion of the population; a sample is a subset of a population that is explicitly strained to make population inferences. A sample is a lesser group or sub-group from the accessible population (Mugenda and Mugenda,

1999). Therefore, using this technique in sample size determination help in getting feedback that decisions concerning the objective of this study can be concluded.

$$n = \frac{N}{1 + N(e)^2}$$

Where:

N = Population

e = Level of significance/sampling error (0.05)

1 = A constant value

Therefore,

$$n = \frac{1\ 332}{1 + 1332(0.05)^2}$$

$1332 = 1 + 3.33n$

$n = 1332 / 4.33 = 307.62$

$\approx 308$ sample size

Thus, three hundred and eight employees made of staff in all management and operation levels including senior, executive, and junior staff. In the questionnaire, these we classified as top-level management, middle-level management, and working-level employees. It is normal for the response rate to be below 100%, thus the big sample size would cushion any non-response.

### 3.5.3 Sampling Technique

This involved the senior, middle, and low-level staff members of Guinness Nigeria firm. According to Asika (2012), well-defined a sample as precisely a portion of the population; a sample is a subset of a population that is explicitly strained to make population inferences. A sample is a lesser group or sub-group from the accessible population (Mugenda and Mugenda, 1999). Therefore, using this technique in sample size determination help in getting feedback that decisions concerning the objective of this study can be concluded. The tactic was economical in collecting sufficient data from a large sample population with minimal contacts hence reducing the chances for spreading the novel coronavirus.

## 3.6 Data Collection

### 3.6.1 Research Instruments

The previous section of this chapter has established the use of the positivism paradigm in determining the survey approach. Therefore, the study uses a structured qualitative closed-ended questionnaire since it is effective in extracting data from survey research. It has a superb ability to reveal experiences, beliefs, and behaviors exhibited by the relevant participant. It can be disseminated to them through email, telephone, post, or via online platforms like survey monkey. There are cheaper platforms like google forms as adopted in this research.

Since the research want to adhere to epistemology standings as dictated by the positivism paradigm; a questionnaire was chosen as the research instrument over structured interviews because it allows the researcher to stick and do independent studies free from bias or external influence on the data. The email questionnaire approach was helpful in collecting data without physical contact as required by the COVID-19 control guidelines.

The closed-ended questions give participants an objective-based option and follow directions that are pertinent. This shows options on a Likert scale 1-4 where the respondents can rank their options on what they think about every item chosen in the survey questions. This ranking shows options such as strongly agreed (4), agreed (3) disagreed (2) and strongly disagreed (1) on the standardized questionnaire.

### *3.6.1.1 Questionnaire development*

The data collection instrument will be a structured Likert scale questionnaire to be designed by the researcher on the effects of technological innovation on the development of products using Guinness Nigeria as a case study. This scale is ranked and measures different respondents' views on the challenges of technological innovations to new product development, technological innovation, and new product development as well as technology innovation and quality of new product development.

The scale is best used for this study because the respondents have options which rank their views on each of the item stated on the survey instrument. The scale on the Likert designed questions results also yield divergent views that offer better options and information regarding the direction of the study than using only yes or no questions or other scales that don't provide such an alternative option.

The instrument will be divided into sections: section A will make responses on the demographic and socio-economic background from respondents and other variables of study concern are presented in section B. The purpose of the closed-ended Likert scale questions is to restrict the answers of the respondents; this will provide a comparative analysis-based objective and will help to offer diverse information on a scale that will help to provide answers to the identified research

questions formulated. To facilitate the study, alternatives and clear instructions will be given to respondents in the closed-ended questions. Four-point Likert scale properties are described below:

**Strongly Agree = SA = 4, Agree = A = 3,**

**Disagree = D = 2**

**Strongly disagree = SD = 1**

Saunders, Lewis, and Thornbill (2019) state that open-ended questions are useful in extracting deeper perception because they allow research participants to give their opinions using their choice of words. However, the respondent may become impatient when writing their feedback thus risking the process due to reduced response rate. Hence, this research opted for the closed-ended question because they collect significant data amounts from a respondent effectively and it is a better option for survey research with this magnitude of sample size Saunders, Lewis, and Thornbill (2019).

### *3.6.1.2 Questionnaire design principles*

An online survey can fail if the nonresponse rate is high. Hence the closed-ended questions were used as an effort to obtain as considerable data as conceivable to recognize shared patterns of replies. Respondents are given the chance to express to the investigator what their views are on the topic being discussed by answering the questions. The investigator recognized some organizations might not be completely easy with responding to all the inquiries anticipated which implies that closed-ended questions would limit the potential information.

### 3.6.2 Pilot Study

Since the questionnaire was new, there was a need to conduct a pilot study of this research. Creswell (2019) suggests that we need it to confirm whether the newly constructed questionnaire captures the attitudes, experiences, and beliefs of the research participants. Therefore, to guarantee the research tool's validity and reliability, the research administered ten percent of the selected sample. For instance, 31 to 32 staff in one department will be questioned to develop the pilot study. This may also be done to separate samples so that present errors in this research tool can be exposed.

By looking at the various variables used to capture the effect of technological innovation on new product development in Guinness plc as it is presented below and gathering the several data gotten from the fieldwork, it contributes to a broader understanding of the analysis.

### 3.6.3 Validity of research instrument

The questionnaire is validated by constant reviewing and modifications from a supervisor and colleagues before sending them out for a pilot survey test and proper administration. This is in accordance with (Mugenda and Mugenda, 1999) who well-defined validity as the degree of consistency that variables measure in a research instrument. According to Saunders, Lewis, & Thornbill (2009), they also contended that the research tool is only valid if it studies what it intends to study, and only if the findings are verifiable.

### 3.6.4 Reliability of research instrument

Cronbach's alpha assesses research instrument reliability. The determination of the reliability in using closed questions is crucial since the questionnaire used here has never been used before. The participants' feedback in the pilot study was used to examine the consistency, and the value of reliability should pass the 0.7 marks on a scale of 0 to 1.

#### *3.6.4.1 Reliability statistics: results*

The previous section stated the importance of doing a pilot study. Through the application of Cronbach's alpha in examining the 30 responses from the pilot study and the value obtained passed 0.7 thus it is clear the questionnaire had excellent internal consistency in selected variables, namely; Innovation, Product development, leadership, and competitive advantage.

## 3.7 Data Analysis

Primary Data in this research should be presented in a logical manner hence the use of inferential and explanatory analysis. The hypothesis was examined using regression analysis to identify cause and effect. Two primary forms of scientific study determine the structure of subjective, qualitative, and quantitative data obtained. Qualitative data is any knowledge conveyed in terms, while quantitative data is all details that can be represented in numbers (Bryman, 2012). The qualitative approach is ideally adapted to an in-depth study of a topic in its sense, whereas the quantitative approach is empirical and better suitable to experiments that gather data by surveys or other systematic collection methods (Bryman, 2012). I chose to collect primary data using a comprehensive methodology with an electronic sample of fixed answer alternatives.

I chose quantitative and qualitative data because of the spatial position of our population and because we had already agreed at this stage that the data should be obtained online. There have

been, of example, disadvantages of the usage of a quantitative approach, but in certain situations, such negatives may either be negated or explained based on their inevitability.

One drawback of the quantitative testing approach is that the investigator has indeed selected the questions that are important and so there are just a limited amount of pre-set responses (Jacobsen, 2002; Wärneryd, 1993). This can be justified, though, as the questions in this analysis focus on the elements and hypotheses of previous studies that are specifically relevant to the studies problem in this report. According to Jacobsen (2002), another drawback in quantitative analysis is that the responses are superficial and do not include in-depth knowledge. This is attributed to the assumption that the work is directed at broad populations and not at particular people needing standardization and simplification.

Furthermore, two of the conditions for successful research involved that work has to be parsimony, where resources (time and energy, for example) are wisely and efficiently disposed of (Jacobsen, 2002). The main conditions are that the study has to be repeated, which implies that the same work will yield the same findings as it is performed over and over again (Bryman, 2012).

Also, empirical research does not, however, explicitly support theoretical positions as some studies show a significant and robust association between technological innovation and the development of new goods. However, several methods followed by researchers have often generated findings and assumptions that are contradictory and inconsistent. This may contribute to methodological problems.

### 3.7.1 Research hypothesis

The data will be analyzed using both descriptive and inferential statistics. To evaluate the hypotheses, statistical statistics such as frequency distribution and basic percentages will be used to examine the demographic characteristic of the sample populations. In contrast, regression will be used to evaluate the hypothesis. This method offered good evidence to test the stated hypothesis. The research hypothesis is as follows:

1. $H_{0:}$ Technological innovations does not significantly impact on the quality of NPD in Guinness Nigeria.

   $H_{1:}$ Technological innovations have a significant impact on the quality of NPD in Guinness Nigeria.

2. $H_0$: the degree of emphasis placed on organizational innovation does not have a significant influence on new product development performance.

   $H_2$: the degree of emphasis placed on organizational innovation has a significant influence on new product development performance

3. $H_0$: business scale does not influence NPD significantly.

   $H_1$: business scale tendency influences NPD significantly.

### 3.7.2 Model Specification

This research applied the following regression model;

1. Hypothesis 1: OC=a1 + a2LD +e;
2. Hypothesis 2: CA = b1 +b2OC + e
3. Hypothesis 3: OP = y1 + y2OC + e

Where OC = organization culture, OP = Organization performance, LD = Leadership and CA = competitive advantage and a1, b1, y1, a2, b2 and y2 are constant, and e is the white noise value that represents the effects remaining exogenous factors that can alter dependent variables.

## 3.8 Ethical Considerations

Before answering any questions, a consent form that was prepared by the researcher to document the respondent's consent for the sole use of the interview in the research project was attached alongside with the administration. The advantage of this is that respondents are given the opportunity to be informed fully about the nature and implications of their participation from the very beginning. In addition to this, the researcher is also protected against any potential future results. However, the survey was not as successful the researcher had hoped.

The researcher will explain the study to the participants and the article will be for scholarly purposes only. This should be made explicit that involvement is optional and that the respondents are entitled to exclude or decline at any point during the study process. Respondents should not be required to engage in the report. Participants will be given their consent to participate or to choose whether or not to participate. We would also be assured that their identity will be covered by specific secrecy requirements.

## 3.9 Limitations

This research adopts an exploratory method due to the constrained research carried out on technological innovation and new product development in Nigeria. Owing to the detached locations of the respondents, the investigator was not able to involve in a face to face administration of the questionnaire. I was left with the option to use an email alternative as a means of reaching out and data- gathering data required for the analysis. Lack of finance and the restricted period allocated to the investigator to conclude this research correspondingly delayed the deepness of this research. Discovery establishments who remained eager to take part proved tremendously is problematic owing to disinclination in preparedness to take part. Also due to the Coronavirus pandemic devastating the globe, it affects the number of people that I can reach to sample their views.

## Challenges of technological innovation and NPD

1. Inadequate and low IT literacy limits the capacity of the organization to adopt technological innovations and new product development.

2. Lack of experience in technology usage hinders employees from accepting the adoption of technological innovations towards new product development

3. The inability to invent and commercialize inventions affects new product development in an organization.

4. Technical risks involved in industrial research and development for products processed in a laboratory limits development of a new product.

5. Organizational culture and ethics often make workers more conservative in accepting new technological innovations towards new product development.

6. Firms continue to deliver products that fail because of the problem of harnessing technological innovations with NPD.

**Technological innovation and new products development**

7. New product development indicates that firms pay more attention to innovations so that they are in a better position to survive, grow, and prosper.

8. Technological innovations provide better access and techniques for developing new products from product development to market launch.

9. Technological innovation increases output at minimal production cost.

10. Technological innovations give new possibilities for new products distribution with relatively lower costs

11. Technological innovation is the main driving force for new product development in organizations and management decisions

**Technology innovation and the quality of new product development.**

12. Technological innovations enhance the development of new quality products in an emerging market.

13. The methods of product development depend on the role technological innovation plays on new product development in organizations.

14. Successful product development necessitates products that are advanced and sold profitably through innovations in technology.

15. Through technological innovation, the firms' ability to develop quality products and compete with their rival firms, improving their competitive advantage over time.

# CHAPTER FOUR

# 4.0 DATA PRESENTATION AND ANALYSIS

## 4.1 Introduction

This section of the study deals with the data analysis and interpretation of the collected data with the help of the questionnaire on the effect of technological innovation on product development using Guinness Nigeria Plc. At first 20 copies of the questionnaire were sent out via mail for a pilot survey to test the validity and reliability of the variables used to capture the objectives stated. Some of these variables include the following Inadequate and low IT literacy limits the capacity of the organization to adopt technological innovations and new product development. Lack of experience in technology usage hinders employees from accepting the adoption of technological innovations towards new product development. The inability to invent and commercialize inventions affects new product development in an organization.

New product development indicates that firms pay more attention to innovations so that they are in a better position to survive, grow, and prosper. Technological innovations provide better access and techniques for developing new products from product development to market launch. Technological innovation increases output at minimal production cost.

Technological innovations enhance the development of new quality products in an emerging market. The methods of product development depend on the role technological innovation plays on new product development in organizations. Successful product development necessitates products that are advanced and sold profitably through innovations in technology.

After ascertaining the validity and reliability of the instrument, 308 copies of the questionnaires were administered to the employees of the company however, 115 were properly filled and returned. Inferences are therefore made based on responses from the target respondents. Suitable procedures such as frequency and simple percentages were used to analyze the demographic background of the target respondents and research questions.

## 4.2 Presentation and Analysis of Questionnaire

This section deals with the analysis of the respondent's demographic characteristics. It revealed the frequency distribution, percentages of the respondents at a look.

**1** *Table 4.1: Demographic Characteristics of Respondents*

| **Ages** | | Frequency | Percentages |
|---|---|---|---|
| Valid | 18 - 30 years | 70 | 63.6 |
| | 31 - 43 Years | 31 | 28.2 |
| | 44 - 56 years | 14 | 8.2 |
| | Total | 115 | 100.0 |
| **Work Experience** | | | |
| Valid | Less than 5 yrs. | 51 | 46.4 |
| | 5 - 9 yrs. | 46 | 41.8 |
| | 10 - 14 yrs. | 11 | 10.0 |
| | 15 - 19 yrs. | 7 | 1.8 |
| | Total | 115 | 100.0 |
| **Staff Level** | | | |
| Valid | Junior level | 73 | 66.4 |
| | Middle level | 30 | 27.3 |
| | Top-level | 12 | 6.4 |
| | Total | 115 | 100.0 |

***Source: Survey Questionnaire, 2020***

Analysis of table 4.1 showed the frequency distribution and percentage analysis of the respondents according to their gender, age, marital status, academic qualification, working experience, and staff level. It showed that most of the respondent falls within the age bracket of 18-30yrs with a

frequency count of 70(63.7%), 31 (28.2%) within the age bracket of 31-40 years while 14(8.2%) were within the age bracket of 44-56yrs.

With regards to working experience, the result from the survey showed that 51(46.4%) of the respondents were less than 5 years of working experience, 46(41.8%) of the respondents were of the view that they were 5-9 years' work experience, 11(10.0%) of the respondents were 10-14 years while 7(1.8%) were 15-19 years working experience. In terms of the management level of the respondents, 73(66.4%) of the respondents were in junior level management, 30(27.3%) were in middle level while 12(6.4%) of the respondents were top-level managers.

## 4.3 Analysis of the questionnaire items represented in percentage and mean score

All the items in the questionnaire are summarized using the means score and percentages.

*2Table 4.2: Cronbach's Alpha Reliability*

**Reliability Statistics**

| Cronbach's Alpha | No of Items |
|---|---|
| 0.891 | 31 |

***Source: Survey Questionnaire 2020.***

Table 4.2 above presents the Cronbach's alpha reliability test for the items used to capture the variables as contained in the questionnaire in the appendix one and the operationalization and measurement of variables section in chapter three of the study. The result in the scale in the table above has a strong α coefficient of 0.891 based on the responses of the survey. It can be concluded

that the instrument of measurement has an acceptable internal consistency which measured what it is intended to measure over time.

Cronbach's coefficient α as shown in the table was employed to determine the internal consistency coefficients of the items included in the questionnaire through a pilot study with 5 items. This result of the reliability analysis is consistent with the work of (Mansour, 2015) whose result indicated that the items in the six scales used had an acceptable discriminating power. Likewise, in a research conducted by Abraham & Barker (2014) which focuses with gender differences in motivation and engagement of senior secondary physics students the result of alpha is directly linked with both terms: "In a preliminary analysis, they examined the Cronbach's alpha estimate of internal consistency of each a priori scale, provision for the six-factor model necessitates the satisfactory reliability for each scale (i.e. alpha = 0.70 or above).

Furthermore, empirical evidence of the work of Casanoves, González, Salvadó, Haro & Novo (2015) is also consistent with the findings made in this study where they studied the attitudes towards and knowledge of biotechnology among Spanish university students' preparing for teaching. In their analysis, they used components of the 21-item instrument questioning respondents to criticize whether reports were true or false. It was concluded that the item on the instrument measured "knowledge level of biotechnology and genetics".

It was further stated that "the reliability (Cronbach's α) of the knowledge questionnaire was 0.721. The result of the alpha, therefore, suggests an indication of the reliability of the 21 items jointly in evaluating the "knowledge level of biotechnology and genetics" implicitly treated as a unitary construct. Further authors similarly recommend or suggest that a high value of Cronbach's alpha is required when a test of knowledge contains items examining across a variety of dissimilar science perceptions. Also, Yang, Lin, She and Huang (2015) on the validity of instrument using

"a two-tier multiple-choice diagnostic instrument developed to measure the degree of students' conceptual supportive comprehension in science indicates (Cronbach's $\alpha = 0.81$)" which is a mark of prior knowledge across six diverse topics.

## 4.3.1 Questionnaire items addressing organization performance construct

### *4.3.1.1 Sample tests statistics and test significance*

| S/N | Challenges of Technological Innovations to New product Development | SA (%) 4 | A (%) 3 | D (%) 2 | SD (%) 1 |
|---|---|---|---|---|---|
| 1 | Inadequate and low IT literacy limits the capacity of the organization to adopt technological innovations and new product development. | 48(41.7) | 35(30.4) | 8(7) | 24(20.9) |
| 2 | Lack of experience in technology usage hinders employees from accepting the adoption of technological innovations towards new product development | 47 (40.9) | 37(32.1) | 20(17.4) | 11(9.6) |
| 3 | The inability to invent and commercialize inventions affects new product development in an organization. | 70(60.9) | 24(20.9) | 11(9.6) | 5(4.3) |
| 4 | Technical risks involved in industrial research and development for products processed in a laboratory | 69(60.0%) | 36(31.30) | 6(5.74%) | 4(3.47) |
| 5 | Organizational culture and ethics often make workers more conservative in accepting new technological innovations towards new product development. | 52(45.22) | 58(50.35) | 5(4.35%) | - |

| | | | | | |
|---|---|---|---|---|---|
| 6 | Firms continue to deliver products that fail because of the problem of harnessing technological innovations with NPD. | 46(40.0) | 34(29.6) | 8(7.0) | 27(23.5) |

**3***Table 4.3: Challenges of Technological Innovations to New product Development*

***Source: Survey Questionnaire, 2020***

Table 4.3 presents the various challenges of technological innovations to new products developed according to the views of the respondents. On the item "inadequate and low IT literacy level limits capacity of the organization to adopt technological innovations to new product development" the result showed that 48(41.7%) of the respondent strongly agree, 35(30.4%) agree, 8(7.0%) disagreed while 24(20.9%) strongly disagree. In addition, 47(40.9%) of the respondents strongly agree, 37(32.1%) agreed, 20(17.4%) disagree while 11(9.6%) strongly disagree that Lack of experience on technology usage hinders employees from accepting the adoption technological innovations towards new product development.

Respondents' opinions further attested that 70 (60.9%) strongly agreed, 24(20.9%) agreed, 11(9.6%) disagreed while 5(4.3%) strongly disagreed with the assertion that the inability to invent and commercialize inventions affects new product development in an organization.

The analysis of the table on identifying if technical risks involved in industrial research and development for products processed in a laboratory limits development of a new product showed that 69(60.0%) of the respondents strongly agreed, 36(31.30%) agreed, 4(3.47) strongly disagreed while 6(5.74%) disagreed with the view that technical risks involved in industrial research and development for products processed in a laboratory limits development of a new product. Overall, respondents show that a larger percentage of the sample agreed that technical risks involved in

industrial research and development for products processed in a laboratory limits development of a new product.

### 4.3.2 Questionnaire items addressing organization culture construct

#### *4.3.2.1 Sample Statistics and test significance*

52(45.22%) respondents strongly agreed, 58(50.35%) agreed, while 5(4.35%) of the respondents disagreed that organizational culture and ethics often make workers more conservative in accepting new technological innovations towards new product development. Respondents views additionally indicated that 46(40.0%) of the respondents strongly agreed, 34(29.6%) agreed, 8(7.0%) disagreed while 27(23.5%) of the remaining respondents strongly disagreed that firms continue to deliver products that fail because of the problem of harnessing technological innovations with NPD.

The responses from overall indicated that the challenges identified have a significant impact on new product development in organizations over time. This is despite extensive research on how to achieve success in NPD, firms continue to deliver products that fail due to the problem of harnessing technological innovations with NPD.

This study, however, corroborates with the work of Nazila, Gholamhossein, Hamida, and Mina (2017) who identified critical success factors of new product development based on the relevant literature and expert opinions in Iranian pharmaceutical industry. For example, they identified in their research that there has been a shortage of impressive aboriginal attempts to establish innovative technologies. The degree of technological advancement in Nigeria according to them is small and entrepreneurship is high. This to them is attributed to fiscal, financial, socio-cultural,

and environmental factors as identified. Nonetheless, the structural environment and the capacity to promote creativity are poor. Nigerians require to establish a coherent national strategy for research, technology, and innovation through professional education and training.

Our findings from the respondents in answering our research questions suggest and offer blueprint towards major challenges affecting new product development and the adoption of technological innovations in the manufacturing industry. This result hence, indicates that new product development can be hampered if the challenges identified in this section of the study relating to technological innovations are not tackled.

Organizations, therefore, have leading roles to play towards blending technological innovations and new product development in their respective organizations while the work out strategies to solving the critical issues facing them in the organization.

### 4.3.3 Questionnaire items addressing competitive advantage construct

**To what extent does technological innovation affect new product development in Guinness Nigeria Plc?**

| S/N | Item | SA (%) | A (%) | D (%) | SD (%) |
|---|---|---|---|---|---|
| | | **4** | **3** | **2** | **1** |
| 1 | New product development indicates that firms pay more attention to innovations so that they are in a better position to survive, grow, and prosper. | 71(61.7) | 23(20.0) | 9(7.8) | 12(10.4) |
| 2 | Technological innovations provide better access and techniques for developing new products from product development to market launch. | 65(56.5) | 39(33.9) | - | 11(9.6) |

| | | | | | |
|---|---|---|---|---|---|
| 3 | Technological innovations increase output at minimal production cost. | 70(60.9) | 28(24.4) | 9(7.8) | 8(7.0) |
| 4 | Technological innovations give new possibilities for new product distribution with relatively lower costs. | 58(50.4) | 18(15.7%) | 23(20.0) | 16(13.9) |
| 5 | Technological innovation is the main driving force for new product development in organizations and management decisions | 45(39.1) | 44(38.3%) | 17(14.8) | 9(7.8%) |

*4Table 4.4: Technological Innovation and New Products Development*

**Source: Survey Questionnaire, 2020**

Table 4.4 showed the roles of technological innovation in new product development in Guinness Nigeria Plc. Respondents assessments were reflected on the table above; the result showed that 71(61.7%) of the respondents strongly agree, 23(20.0%) agree, 9(7.8%) disagree and 12(10.4%) strongly disagreed with the views that New product development indicates that firms pay more attention to innovations so that they are in a better position to survive, grow, and prosper.

Furthermore, in response to the item "technological innovations provide better access and techniques to developing new products from product development to market launch" respondents opinions indicated that 65(56.5%) of the respondents strongly agree, 39(33.9%) agree, 11(9.6%) strongly disagree. More so, the results showed that 70(60.9%) of the respondent strongly agreed, 28(24.4%) agreed, 9(7.8%) disagreed, and 8(7.0%) strongly disagreed with the assertion that technological innovations increase output at minimal production cost.

Correspondingly, 58(50.4%) strongly agreed, 18(15.7%) of the respondents agree, 23(20.0%) disagree, 16(13.9%) strongly disagree that Technological innovations give new possibilities for new products distribution with relatively lower costs. This implies that overall, a larger percentage

of the respondents were of the views that technological innovations give new possibilities for new product distribution with relatively lower costs.

The result further showed that 45(39.1%) of the respondents strongly agreed, 44(38.3%) agreed, 17(14.8%) disagreed while 9(7.8%) of the respondents were those that strongly disagreed that technological innovation is the main driving force for new product development in organizations and management decisions. This implies that overall, respondents revealed that a larger percentage of the sample was of the view that the companies that technological innovation is the main driving force for new product development in organizations and management decisions. Also, organizations are capable of accelerating growth through increased adoption of technological innovations and new product development.

The findings made in this section of the study offer great insight into answering our research question formulated in identifying the effect of technological innovations on new product development in an organization. From the feedback gotten, it demonstrates that technological innovations have the capacity and play vital roles to significantly influence new product development in an organization. Our submission, therefore, corroborates with the work of Oyewale, Adeyemo, and Ogunleye (2013) who recognized that technological innovation has an essential means for the development of entrepreneurship in Nigeria. The result of their regression analysis showed that a significant relationship exists in Nigeria between technological innovation and the growth of entrepreneurship. Hence, the organization must have the foresight to accepting technological innovations adoption in their organizations towards product development and organizational progress in this digital economy era we are in.

### *4.3.3.1 Sample Statistics and test significance*

*5Table 4.5: Technology Innovation and Quality of New Products Development.*

| S/N | Item | SA (%) | A (%) | D (%) | SD (%) |
|---|---|---|---|---|---|
| | | **4** | **3** | **2** | **1** |
| 1 | Technological innovations enhance the development of new quality products in an emerging market. | 47(40.9) | 37(32.2) | 23(20) | 8(7.0) |
| 3 | The methods of product development depend on the role technological innovation plays on new product development in organizations. | 64(55.7) | 34(29.6) | 8(7.0) | 9(7.8) |
| 3 | Successful product development necessitates products that are advanced and sold profitably through | 68(59.1) | 36(31.3) | 5(4.3) | 6(5.2%) |
| 5 | Through technological innovation, the firms' ability to develop quality products and compete with their rival firms, improving their competitive advantage over time. | 47(40.9) | 37 (32.2) | 31(27.0) | - |

**Source: Survey Questionnaire, 2020**

Analysis of table 4.5 regarding technology innovation impacts on new products development in Guinness Nigeria Plc. showed that 47(40.9%) strongly agree, 37(32.2%) of the respondents agreed, 23(20.0%) disagree and 8(7.0%) strongly disagree that technological innovations enhance the development of new quality products in an emerging market. This implies that overall, a larger percentage of the respondents agreed that technological innovations enhance the development of new quality products in an emerging market.

Moreover, on the item "the methods of product development depend on the role technological innovation plays on new product development in organizations" indicated that 64(55.9%) strongly agree, 34(29.6%) agree, 8(7.0%) disagree and 9(7.8%) strongly disagreed. The result also revealed that 68(59.1%) of the respondent strongly agree, 36(31.3%) agree, 5(4.3%) disagree, and 6(5.2%)

strongly disagreed that successful product development necessitates products that are advanced and sold profitably through innovations in technology.

Additionally, 47(40.9%) of the respondents strongly agree, 37(32.2%) agree while 31(27.0%) disagreed that through technological innovation, the firms' ability to develop quality products and compete with their rival firms, improving their competitive advantage over time. This means that overall, a larger percentage of the respondents agreed that the adoption of technological innovations has a significant impact on the quality of new products developed in an organization. From the response gotten from this study, it offers greater insights into the roles technological innovations play in achieving the quality of new product development in Nigeria. Our submission and feedback provide critical directions and ideas to organizations that aspire to be on the cutting edge of leadership in their industry to embrace technological innovations in their product development, management decisions, and organizational ethics. This is because the reward from tech innovations in the digitalized world is great and first-mover advantages to organizations will gain more rewards in the long run.

The findings made hence corroborates with the work of Oyewale, Adeyemo, and Ogunleye (2013 and Onu, Olabode, and Fakunmoju (2015) who carried out a research to determine the effect of information technology investment on employee's output performance. The findings of the study showed that there exist a strong positive relationship and significant effect between aggregate output, technology usage, work environment, and management style and that the technological usage in production processes has the highest contribution to boost aggregate output performance of employees in sachet and table water manufacturing companies.

## 4.4 Research Hypothesis: Results

### 4.4.1 Hypothesis One

$H_{0:}$ Technological innovations does not significantly impact on the quality of NPD in Guinness Nigeria.

$H_{1:}$ Technological innovations have a significant impact on the quality of NPD in Guinness Nigeria.

*6Table 4.6: Regression analysis Showing Technological Innovation Impacts on New Products Development.*

**Model Summary**

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate | Change Statistics | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | R Square Change | F Change | df1 | df2 | Sig. F Change |
| 1 | .419[a] | .176 | 0.173 | .63090 | .176 | 68.532 | 1 | 321 | .000 |

a. Predictors: (Constant), Technological innovations.

**Coefficients[a]**

| Model | | Unstandardized Coefficients | | Standardized Coefficients | T | Sig. |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | |
| 1 | (Constant) | 2.316 | .192 | | 12.079 | .000 |
| | Konga online e-commerce | .390 | .047 | .419 | 8.278 | .000 |

a. Dependent Variable: Development of new quality products in an emerging market.

***Source: Survey Questionnaire, 2020***

Analysis of Table 4.6 presents the results of the regression analysis of technological innovations on NPD. The findings revealed that there is a significant relationship between technological innovations and new product development in organizations. The constant term implies that when there is no unit change in the explanatory variable, product development significantly increases by 2.3 %. A unit change in the technological innovations in enhancing the development of new quality products in an emerging market while holding other factors constant results to 39.0%.

Overall, the $R^2$ of 0.176 implies that 17.6% of the changes in technological innovations in enhancing the development of new quality products in an emerging market. The f- statistic similarly confirms that there is a joint overall significant relationship between technological

innovations and new product developments in organizations. The null hypothesis is therefore rejected while the alternative hypothesis is accepted that technology innovation has a significant impact on new product development in Guinness Nigeria Plc.

This result corroborates with the work of Eneji, Nnandy, Gukat, and Odey (2018) whose multiple regression techniques are conducted using secondary evidence. The result indicates that the diffusion of indigenous technology would have a pervasive, but distinct, effect on Nigeria's entrepreneurship across the agriculture, manufacturing, and service sectors, including telecommunications. The education and private sectors in Nigeria will play a leading role in the incubation, invention, introduction, and transition of indigenous technology. It is concluded that innovation and entrepreneurship will improve jobs in Nigeria.

*7Table 4.7: Correlation Analysis between Technological innovations and its impact on the quality of NPD*

| | | Technological Innovations | Quality of NPD |
|---|---|---|---|
| Technological Innovations | Pearson Correlation | 1 | .794** |
| | Sig. (2-tailed) | | .000 |
| | N | 115 | 115 |
| Quality of NPD | Pearson Correlation | 0.794** | 1 |
| | Sig. (2-tailed) | 0.000 | |
| | N | 115 | 115 |

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

**Source: Survey Questionnaire 2020**

Analysis of table 4.7 showed the result of the correlations analysis to determine if technological innovations significantly impact on the quality of NPD in Guinness Nigeria Plc. The result indicated that there is a significant positive relationship between technological innovations and the quality of NPD in Guinness Nigeria Plc. with a correlation coefficient of 0.794 and a significant level of 0.000.

### 4.4.2 Hypothesis Two

$H_0$: the degree of emphasis placed on organizational innovation does not have a significant influence on new product development performance.

$H_1$: the degree of emphasis placed on organizational innovation has a significant influence on new product development performance.

**Table 4.8** presents a regression analysis for the degree of emphasis placed on organizational innovation when predicting new product development performance. The table shows their correlation coefficient value is 0.541 thus indicating the presence of significant relationships between the two variables. R-squared from the fitted model implies 32.7% variations in organization performance with $p<.05$ and $F=76.246$ from ANOVA. These values imply there is significant organizational performance. Hence the null hypothesis does not hold and it is rejected. Therefore, an increase in the degree of emphasis placed on organizational innovation culture cause a significant rise in the new product performance.

*8Table 4.8: Regression findings for organization innovation versus new product development performance*

| **Model** | **R** | **$R^2$** | **Adjusted $R^2$** | **Std. error** | |
|---|---|---|---|---|---|
| 1 | 57.1[a]% | 32.5% | 32.1% | 95.086% | |
| ANOVA[a] | | | | | |
| **Model 1** | **Sum of square** | **df** | **Mean square** | **f** | **Sig.** |
| Regression | $6.8937x10^1$ | $1.000x10^0$ | $6.8937x10^1$ | $7.6246x10^1$ | 0.000[b] |
| Residual | $1.4253x10^2$ | $1.580x10^2$ | $9.0400x10^{-1}$ | | |
| Total | $2.1179x10^2$ | $1.590x10^2$ | | | |

## 4.4.3 Hypothesis Three

$H_0$: business scale does not influences NPD significantly.

$H_1$: business scale tendency influences NPD significantly.

Studying the effect of organization business scale on NPD process is controversial, the research shows that it does not impact heavily on the improvement of NPD performance.

*9Table 4.9: T-test on business scale influence on NPD performance*

| NPD performance | Mean score for small firms | Mean score for big firms | t-value | p-value |
|---|---|---|---|---|
| Overall NPD performance | 21.68% | 55.55% | -1.33 | 0.157 |
| NPD performance | Low-level management | High-level management | | |
| Overall performance mean | 8.145% | 54.88% | -4.84 | p-value 0.000*** |

Table 4.9 shows their correlation coefficient value is 0.157 thus indicating the presence of an insignificant relationship between the two variables. These values imply there is little change in the NPD process. Hence the null hypothesis is acceptable. Therefore, an increase in organizational has little effect on the NPD process.

# CHAPTER FIVE

## 5.0 Discussion, Practical Implications, and Limitation

This desertion aims to test the impact of technology on the NPD process in Guinness Nigeria to achieve the main goal, the research studied several variables and their relationship. These variables are; technological innovation, leadership and culture, competitive advantage, and organizational performance. These variables formulated the null hypothesis in this research work. The data collected and its analysis formed the basis rejection of two of the null hypotheses and acceptance of one hypothesis. The next section will discuss the results fully by linking them with previous literatures. The remaining sections will discuss the practical implications briefly and the limitation associated with this research work.

This chapter also deals with the discussions, summary of major findings, on the study effect of technological innovation on product development using Guinness Nigeria Plc. as the case study. In conjunction with the findings, this section aims to summarize the role of technology in innovation as it relates to Guinness Nigeria, recommendations offered as a way to improve productivity and suggestions in how the case study upon the development of innovation and productivity can be further studied.

## 5.1 Discussion of Findings, Summary, and Comparison with Previous Studies

### 5.1.1 Discussion of Findings and Comparison with Previous Studies

Overall, the majority of the respondents were aware of the importance and challenges affecting technology innovations and new product development in organizations. They also identified the roles of technological innovations in new products in organizations. Such roles as identified by innovations in an organization. The respondents are successful product development necessitates the use of technologies.

Likewise, technological innovations enhance the development of new quality products in an emerging market. For instance, due to the increasing level of competition witnessed in the breweries industry, these have forced Guinness Nigeria plc. To look in word on how best they can innovate and bring new products to the market in recent times. These have made Guinness Nigeria manufacture the following beer brands over time. These products include Foreign Extra Stout (1962), 7.5% ABV (varies), Harp Lager Beer (1974), 5.15% ABV, Guinness Extra Smooth (2005) 6% ABV, Satzenbrau (November 2006), Harp Lime (2012) – discontinued. Armstrong Black Lager – discontinued Dubic Extra Lager (April 2012) 5% ABV, the RTD (ready-to-drink) products include Gordon's Spark (2001) – discontinued, Smirnoff Ice (September 2006)5.5% ABV, SNAPP (September 2012) 5% ABV, Orijin (August 2013) 6%ABV] (Guinness Nigeria Launched, 2014). The popular Malta (soft drink) drink range includes Malta Guinness (1990), Malta Guinness Low Sugar (May 2012) ("New Malta Guinness, 2014).

The results of the respondent's opinions showed that through technological innovations, firm ability to develop quality products and compete with their rival firms improves alongside their competitive advantage.

Regardless of the fact that there is an increase in awareness recorded, most of the respondents who participated in the research showed that there were factors affecting technological innovations and new product developments in organizations.

Factors such as the inability to invent and commercialize inventions affect new product development in an organization. Inadequate and low IT literacy limits the capacity of the organization to adopt technological innovations and new product development among others identified. The factors identified such as firms continue to deliver products that fail because of the problem of harnessing technological innovations with NPD and lack of experience on technology usage hinders employees from accepting the adoption technological innovations towards new product development among others could also lead to an increase in the costs of productions and cost-effectiveness of organizations.

This result is similar to the work of Nazila, Gholamhossein, Hamida, and Mina (2017) who determined new product development in the pharmaceutical industry evidenced by a generic market. The study identified critical success factors of NPD based on the relevant pieces of literature and expert opinions in the Iranian pharmaceutical industry. Although the NPD success factors seem the same in both generic and bio-generic pharmaceutical industries, the underlying factors and related sub-factors show the different importance in these two industries. Nevertheless, their study revealed that the organization capabilities″ is the most important factor affecting new product development success in both pharmaceutical generic and bio-generic industry. For

instance, an organization that can develop more products using the technological innovations available always remained in the cutting edge of leadership in the industry.

The regression analysis result indicated that there is a significant relationship between technological innovations' impacts on new product development in organizations. The result is in agreement with the work of Eneji, Nnandy, Gukat, and Odey (2018) who evaluated the impact of technology innovation on sustainable entrepreneurship development in Nigeria. Their results show that technology absorption and mastery in Nigeria require more than importation. There has been the absence of remarkable indigenous efforts to evolve an indigenous technology.

Therefore, the Nigerian government and different organizations in their capacity must embrace local adoption and usage of indigenous made tech in developing products and rendering services rather than relying more on the importation of technology and manpower skills to solving the issues of product development in Nigeria. This will help local and able Nigerians to look inward on how best to solve and develop products and services that affect them and serve their daily needs as well as help the economy to prosper and create more jobs for the citizens.

This study, therefore, fills in the gap to the contribution to knowledge by proffering solutions that the educational and private sectors in Nigeria should play a leading role in indigenous technology incubation, innovation, adoption, and transfer. Innovation and entrepreneurship will increase employment in Nigeria.

We as a nation must in all our capacity invest more on the quality of education and empower the private individuals with necessary technological skills and funds to embark on product development as it is critical in the survival of our economy and the diversification of the economy from over-dependence on the oil proceeds over time.

Similarly, our results and line of thoughts are in agreement with the work of Oyewale, Adeyemo, and Ogunleye (2013) who showed that there is a significant relationship between technological innovation and entrepreneurship development in Nigeria. Technology advancement in the form of internet connectivity, telephone (mainlines and mobile), business access to websites, and population growth was defined as a research gap and problem solved and used as proxy variables for their websites. In their study, they pick a total of 12 entrepreneurs from Lagos State who constituted our sample size, a simple random sampling technique was used. Using regression analysis, evidence from their literature shows a significant relationship between technological innovation and the growth of entrepreneurship.

Also, Onu, Olabode, and Fakunmoju (2015) who researched to determine the effect of information technology investment on employee's output performance. The findings of the study showed that there exist a strong positive relationship and significant effect between aggregate output, technology usage, work environment, and management style and that the technological usage in production processes has the highest contribution to boost aggregate output performance of employees in sachet and table water manufacturing companies.

These findings overall provide supports for answering our research questions formulated. Hence, our study is therefore justified and back up with empirical findings in answering identifying the key challenges of technological innovations adoptions on new product development. Also, it identified the effects of technological innovations on new product development. Base on the findings made, there is a need for organizations to adopt technological innovations towards the development of new products as it has a significant impact on the cost and profitability level of the organizations.

### 5.1.2 Summary of Major Findings

The study was carried out to evaluate the effect of technological innovation on product development using Guinness Nigeria Plc. as the case study. Applicable statistical methods such as descriptive and inferential statistics using frequency counts and simple percentages were used to analyze the research questions and the demographic characteristics of respondents while regression analysis and correlation tests were used to analyze the hypotheses formulated. The regression analysis results indicated that there is a significant relationship between technological innovations' impacts on new product development in organizations.

Evidence emanating from the analysis indicates that technological innovation has the capacity to influence the emergence and development of new products in various dimensions. New product development emerges when firms pay more attention to innovations as it helps them to be in a better position to survive, grow, and prosper. Technological innovations from the feedback gotten from the respondents provide better access and techniques to develop new products from product development to market launch. It also helps to increase outputs at minimal production cost. Finally, the respondents acknowledge that technological innovation is the main driving force for new product development in organizations and management decisions.

The applications of technological innovations to new products in Guinness Nigeria could bring about new brands of drinks in the market as well as product diversification in the industry as some of the firms leading in the industry are presently out to compete with their counterpart.

The result of the analysis likewise showed that there is a significant relationship between technological innovations and the quality of new product development in organizations. This

means that through technological innovation adoption in an organization, for instance, Guinness Nigeria, technological innovations can enhance the development of new quality products in an emerging market. It also provides faster methods of products developments as evidence from the study show that the methods of product development depend on the role technological innovation plays on new product development in organizations.

Hence, successful product development necessitates products that are advanced and sold profitably through innovations in technology. Through technological innovation, the firms' ability to develop quality products and compete with their rival firms and improve their competitive advantage over time. Consequently, there is a need to place more emphasis on the organization to adopt technological innovations to the development of their products due to the roles identified in this study regardless of other challenges viewed from different respondents. This will help the organization to gain a larger market share, improves their organizational goals in diverse ways such as profits, turnover from their assets, management decision, employee productivities, and the attraction of investors as well as increase their clients' base both in the short run and long run in the business.

## 5.2 Practical Implications

The research on the impact of technology on NPD process in Guinness Nigeria Plc. Proposed several practical implications in the form of recommendations. Firstly, the research emphasis role of the top managers shaping the organizational culture. Hence managers should emulate the best leadership style because it now evident that progressive management stimulates positive growth and development of an organizational culture that supports innovations, creativity, entrepreneurship, and teamwork, and thus the company enhances its performance.

Secondly, this research predicts that firms are going to rely heavily on the power of their organization's cultural strength in the near future when pursuing significant business performance and develop a sustainable competitive advantage. Furthermore, leaders are likely to spend much of the capital towards the development of a powerful culture that is difficult to find and imperfectly inimitable to retain long-lasting competitive advantage that will support their existence in hostile business surroundings.

### 5.3.1 Recommendations

From the findings made through the study, so many challenges have been exposed, and here are some recommendations that might proffer a solution to these challenges:

i. It is recommended that the government should create a friendly or enabling environment for technological innovations and new product development to strive. This will help consumer goods to increase and boost the Nigerian economy.
ii. The government and organizations should review and expand its skill acquisition program by creating additional skill acquisition centers in addition to the already existing ones to boost skill acquisition and entrepreneurial capabilities of the youths and employees in organizations.
iii. Firms ought to have very much branded new products and services alongside long run trust, with clear objectives.
iv. Firms should attempt to develop new products and know when a client needs changing when products come into the market to cope with such situations.
v. It is significant to check and accept product implementation requirements and strategy specifics together with customer's recognition before venturing into new product development through technological innovations. This will help to guide against most failed products and services resulting from rapid changes in technological innovation across the globe.

These recommendations are, however, in support of the work of Eneji, Nnandy, Gukat, and Odey (2018) who as well suggested that Nigeria requires establishing a coherent national strategy for research, technology, and innovation through professional education and training. Likewise, with the work of Oyewale, Adeyemo, and Ogunleye (2013) who were of the opinion that the

government should create a favorable or encouraging atmosphere for entrepreneurship and consumer goods to boost the economy in Nigeria.

Also, this recommendation corroborates with the work of Serdar and Gloria (2010) who noted that when IT is incorporated into the product development cycle and advocates for IT solutions remain, the odds are that IT will not be implemented and the advantages will not be understood.

### 5.3.2 Suggested Areas for Further Studies

The direction for future research regarding this study should be to consider an extension of the research. This can be done by considering the expansion and incorporations of either similar firms in the same industry or different industries not covered in this study.

Such expansion or direction for future studies will help in finding more vital information that may be omitted from this study and will contribute to the pool of literature already existing in this field of study.

There is a need for future research to extend the list of factors affecting technological innovations and new product development which include "Inadequate and low IT literacy limits the capacity of the organization to adopt technological innovations and new product development."

"Lack of experience in technology usage hinders employees from accepting the adoption of technological innovations towards new product development." "Inability to invent and commercialize inventions affects new product development in an organization" "Technical risks involved in industrial research and development for products processed in a laboratory limits development of a new product" "Organizational culture and ethics often make workers more conservative in accepting new technological innovations towards new products development"

"Firms continue to deliver products that fail because of the problem of harnessing technological innovations with NPD"

By identifying other challenges not mention in this study will bring the development of knowledge in this area of interest as well as offer a new direction for future researchers to embark on new research in the field of interest.

This can be done through a comparative and subjective approach to research and compare the evidence of the findings obtained using the ones done in this study to determine the differences that may be obtained in the results with future findings. This is because my study only conducted research on one firm in the industry and this, however, limits the scope of the study. In doing this, future researchers will be able to identify organizational challenges that are similar or diverse among similar firms in the industry as well as reconcile such difference that exists.

There are some limitations to this research that should be discussed. Although I do not think this is a cause for concern, future research can consider focusing the study on each group of the activities. This could also bring new information and different approach carried out in this study which can bring about consensus to any divergent findings to be made in the nearest future. Even though differences may arise from this study in the nearest future, I do hope this study can serve as a blueprint to any other findings emanating from this study.

Hence, several different research directions could provide additional useful information both to firms finding critical success factors and measuring product development success as well as to academics performing research in this area.

Overall, a strong innovation culture has proved to maintain the life of an organization as support by the evidence in the findings. This refers to how workers interact, their roles, and duty performance which inadvertently influences the performance of that particular firm. The vitality

of technological innovation is amplified by the urge to promote organizational efficiency and effectiveness. Collectively, these factors alter the amount of data obtained as the larger the sample collected for analysis, the high the chances for developing more accurate and robust findings that enhances the validity and reliability of this research.

## 5.4 Limitation

In reference to chapter three of this dissertation, the main limitations associated with this research work include; first, is the adoption of an exploratory method due to the constrained research carried out on technological innovation and new product development in Guinness Nigeria. Second, is that the location of the respondent detached the investigator from the participant's. Therefore, face to face administration of the questionnaire was impossible. The remaining option was to use the email as the alternative means of reaching out and data- gathering data required for the analysis. Third, is the time restriction and insufficient finance affected the deepness of this research. Finally, due to the Coronavirus pandemic devastating the globe, it affects the number of people that I can reach to sample their views.

# CHAPTER SIX

## 6.0 Conclusion and Recommendations

The findings of this study present useful insights for improving the quality of products and new products developed through the adoption of technological innovation. My findings from the respondents have been able to provide answers to the fascinating questions that prompted me to embark on this study. Evidence identified on the effect of technological innovation on product development and challenges affecting technological innovations and new product development were cleared in this study. The study concluded that technological innovation will enhance the quality of products at least cost advantage and increases the organizational turnover and profits of the firm over time. This typically will lead to significant growth in the overall performance of organizations over time.

Also, the roles of technological innovations on new product development in a collaborative effort among employees and management facilitate the transformation of organizations to be on the cutting edge of leadership in the industry. The analysis of the above-mentioned findings suggests that there are some common agenda between the important factors or challenges affecting the adoption of technological innovations on new products development. Technological innovations are adopted in organizations to designed quality products. Respondent's opinions identified certain factors such as explosive technology changes, especially the microcomputer, Increasing biotechnology, materials, and other technologies limits organizations' capabilities towards new products development, news of any innovation is rapidly dispersed when competitors respond quickly has adverse effects on organizational new products development and technological change.

Other factors identified include inadequate and low IT literacy levels limiting the capacity of the organization in adopting technological innovations to new product development, and the inability to create and commercialize inventions using the latest technological innovations affecting new product development in an organization. Organizations can implement the raising literacy level in this field by deliberately investing more in their manpower capacity through training, workshop, and conferences. This will help in the radical change the organization desire to achieve in their product line diversification because skilled worker tends to perform outstanding results than an employee with lesser technological knowledge. Consequently, there is a need to emphasize more on the factors identified in this study and implement the strategies proffered.

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# Appendix I: Questionnaire

## NATIONAL COLLEGE OF IRELAND

## MSc IN MANAGEMENT

**Survey on**

**Effect of Technological Innovations on New Product Development: A Study of Guinness Nigeria**

Dear Sir /Ma,

**Request for Research Information**

I am a Master's Student at the above-mentioned University. I humbly need your assistance to fill this questionnaire given to you, titled Effect of technological innovations on new product development a study of Guinness Nigeria. The questionnaire is designed to gather information and to ascertain the relationship between technological innovation and new product development using your organization as a case study. Be assured that your responses will be treated with the utmost confidentiality and used purely for academic purpose only.

Thank you for your Co-operation.

Segun Michael Olajuyigbe.

Please tick as appropriate an answer you consider the most appropriate to the choices provided.

## Appendix II: Cover Letter

Hello Sir/Madam,

I hope this finds you well and healthy. I am a master's student at the National College of Ireland located in Dublin, Ireland. I sincerely request your help and support with my research project. This research seeks to investigate the effects of technological innovation on new product development in your organization.

To achieve this, I require you to answer a series of close-ended questions, which would serve as the primary source of data analyzed for the attainment of the research objectives. Please take into consideration that your identities are hidden, the collected data would be securely stored within an SPSS software and your consent will be sought out in the event where the collected data would be used for other research purposes.

If you have any queries, please do not hesitate to contact me or call.

Thanking you in anticipation for your help.

Regards,

Segun Michael Olajuyigbe.

# Appendix III: Research Questionnaire

**Section A: Respondent's Demographic Background**

1. Ages: 18-30 yr. ☐, 31-43 yrs. ☐, 44-56 years ☐, 57-69 yr. ☐, 70 yrs. and above ☐

2. Work Experience: Less than 5 yrs. ☐ 5-9 yrs. ☐ 10-14 yrs. ☐ 15-19 yrs. 20 and above ☐

3. Staff Level: Junior level ☐ Middle-level ☐ Top level ☐

**This section contains statements assessing and identifying the aim of the study please tick as appropriate in the boxes using a tick (√) the statement that describes your choice.**

| s/n | Effects of Technological Innovations to New product Development | SA 4 | A 3 | D 2 | SD 1 |
|---|---|---|---|---|---|
| 1 | Inadequate and low IT literacy limits the capacity of the organization to adopt technological innovations and new | | | | |
| 2 | Lack of experience on technology usage hinders employees from accepting the adoption of technological innovations | | | | |
| 3 | The ability to invent and commercialize inventions affects new product development in an organization. | | | | |
| 4 | Technical risks involved in industrial research and development for products processed in a laboratory limits development of a | | | | |
| 5 | Organizational culture and ethics often make workers more conservative in accepting new technological innovations | | | | |
| 6 | Firms continue to deliver products that fail because of the problems of keeping track technological innovations with NPD | | | | |
| | **Technological innovation and new products development** | **SA** | **A** | **D** | **SD** |
| 7 | New product development indicates that firms pay more attention to innovations so that they are in a better position to | | | | |
| 8 | Technological innovations provide better access and techniques for developing new products from product development to | | | | |
| 9 | Technological innovation increases outputs at minimal production cost. | | | | |

| | | | | | |
|---|---|---|---|---|---|
| 10 | Technological innovations give new possibilities for new products distribution with relatively lower costs | | | | |
| 11 | Technological innovation is the main driving force for new product development in organizations and management | | | | |
| | **Technology innovation and the quality of new product** | **SA** | **A** | **D** | **SD** |
| 12 | Technological innovations enhance the development of new | | | | |
| 13 | The methods of product development depend on the role technological innovation plays on new product development in | | | | |
| 14 | Successful product development necessitates products that are advanced and sold profitably through innovations in | | | | |
| 15 | Through technological innovation, the firms' ability to develop quality products and compete with their rival firms, improving | | | | |