COMPUTER AIDED DESIGN AND COMPUTER AIDED MANUFACTURING TRAINING, COMPETENCY AND USAGE IN TEXTILE INDUSTRIES OF NORTHERN NIGERIA

GAUSA, SOLOMON (MFA)
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A THESIS SUBMITTED IN FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE OF DOCTOR OF PHILOSOPHY (CAD-CAM IN TEXTILE AND FASHION DESIGN) IN THE SCHOOL OF CREATIVE AND PERFORMING ARTS, FILM AND MEDIA STUDIES OF KENYATTA UNIVERSITY

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DECLARATION

This thesis is my original work and has not been presented for a degree in any other university.

Signature:…………………………………….. Date: ………………………

Gausa Solomon – H87F/32376/2015

This thesis has been submitted for review with our approval as University supervisors:

Signature: ………………………………….. Date: ……………………….

Mercy Wanduara (Ph.D.)

Department of Fashion Design and Marketing

Kenyatta University, Nairobi Kenya.

Signature: …………………………………. Date: ………………………

Jacqueline Kisato (Ph.D.)

Department of Fashion Design and Marketing

Kenyatta University, Nairobi Kenya.

DEDICATION

In memory of my late parents Mr. & Mrs. Gausa Kukan, for their encouragement, effort and unwavering love to us all.

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LIST OF ABBREVIATIONS AND ACRONYMS

2D	-	Two Dimensional
3D	-	Three Dimensional
CAD	-	Computer Aided Design
CAM	-	Computer Aided Manufacturing
FGN	-	Federal Government of Nigeria
FMITI	-	Federal Ministry of Industry Trade and Investment
GDP	-	Gross Domestic Product
HND/Degree	-	Higher National Diploma/ Degree
NBS	-	National Bureau of Statistics
ND/NCE	-	National Diploma/National Certificate in Education
SSCE	-	Senior Secondary Certificate Examination

DEFINITION OF TERMS

Apparel: refers to diverse types of outerwear or clothes that are made from textiles such as trousers, shirt, dress, skirt, shorts, t-shirt, blouses and its related articles.

Competency: This refers to a certain ability to do something successfully or efficiently.

Computer-aided design (CAD): is the use of computer systems to assist in cloth or fabric designing and creation of imprint for fabric reproduction.

Computer-aided manufacturing (CAM): it is the use of computers to plan, manage and control the processes of production through a direct or indirect computer interface with machines.

Computer-aided design and Computer-aided manufacturing (CAD-CAM) is the use of computers to create a design and control the production of textile materials.

CAD-CAM program: This is computer software that is meant for the design and manufacturing of a product**.**

CAD-CAM usage: this is the application of the computer software in design and manufacturing processes.

Crocheting refers to the process of creating fabric by interlocking loops of yarn, thread, or strands of other materials using needle-like device called crocheting hooks.

Fabric refers to cloth or other materials produced by weaving, felting, knitting, crocheting, bonding, and flicking together cotton, nylon, wool, silk, or other threads.

Fabric construction: this is the process of converting fiber or yarn into fabric or cloth**.**

Fabric decoration: this is the process of fabric colouration such as printings dyeing embroidery and appliqueing**.**

Fabric finishing: is defined as the processes that convert the grey (unfinished) woven or knitted cloth into usable material.

Fiber refers to tiny flexible hair-like raw materials used in the production of yarns

Ginning: this is the process of removing dirt and cotton seed from the cotton ball.

Knitting: refers to the process of fabric construction that involves interloping of yarns to form a fabric

Pre-fabric construction: refers to a sequence of processes from fiber ginning to yarns production**.**

Sizing: is a process of adding starch to yarn for additional strength during the weaving process.

Spinning: this is the process of converting textile fiber into yarns by drawing and twisting.

Stakeholders: refers to those who can affect or be affected by the organization's actions, objectives and policies. These include; creditors, directors, employees, government (and its agencies), owners (shareholders), suppliers, unions, and the community from which the business draws its resources.

Technology: this is an innovative advancement used in simplifying complex task and processes with speed and efficiency.

Textile industries: these are firms that are concerned with the mass production of textile materials and textile related products.

Textile material: this refers to either woven or non-woven materials.

Textile production: the process used in the manufacture of textile materials**.**

Training: this is a process of new skills acquisition to enable one to be productive in a certain field. There are two types of training formal and informal

Warping: refers to the process of winding warp yarns into the warp beam before the weaving process

Weaving: this is a process of interlacing yarn at 90 degrees to form a fabric.

OPERATIONAL DEFINITION OF TERMS

CAD-CAM Competency: Refers to skills of manipulating the CAD-CAM program efficiently.

CAD Programs: is the use of computer software to assist in a design process to meet market changing demand.

CAM Programs: this refers to the use of computers to control and manage production processes with greater efficiency and precision.

CAD-CAM Training: is a process of acquiring new skills needed to manipulate the CAD-CAM program.

Designers these are workers whose role is to create the fabric or clothes imprint for reproduction.

Financial Status this refers the level of the industry's income, production capacity and exports

Leadership Style this refers to the leader's attitude towards the use of CAD-CAM technologies in design and production.

Staff Competency: this refers to the level of skills acquired, its uptake and application in technology program among the textile industries workers.

Technologists refer to the workers whose role is to operate the machine for the production of fabrics.

Usage: refers to the frequency and efficiency of CAD-CAM program in designing and producing of textile materials in the industries.

Years of Experience: this refers to years of service in the industry.

ABSTRACT

Computer Aided Design (CAD) and Computer Aided Manufacturing (CAM) is the use of technology to design and produce textile goods with greater productivity at low cost. Its usage demands some level of training and competency. The purpose of the study was to assess CAD-CAM training, competency and usage in textile industries of Northern Nigeria in order to develop a CAD-CAM training model. The objectives of study were to identify the level of CAD-CAM training received, to examine the competencies of textile staff, to determine the relationship between work experience and CAD-CAM usage, to establish the relationship between the availability of CAD-CAM program and CAD-CAM usage, to determine the organizational leadership and financial influence on CAD-CAM usage, and to develop a CAD-CAM training model. Purposive sampling was used in selecting the states and industries. Stratified sampling was used to divide the unit of analysis into strata such as CEOs, designers, and technologists. Census sampling was used in selecting eight CEOs. A sample size of 152 was selected from a population of 196. Self-administered questionnaires were shared to CEOs, designers, and technologists. This study used a cross-sectional descriptive survey to collect quantitatively data with a response rate of 96.1% (146), then analyzed it, using statistical package for social science (SPSS) 20. Descriptive statistics were used to generate, group and summarize the data in terms of tables, percentages, means and standard deviation. Pearson's correlation was also used to determine associations between availability of CAD-CAM program, work experience, CAD-CAM training, staff CAD-CAM, staff competency, leadership style, financial status, and CAD-CAM usage. The study findings revealed a low level (44.2%) of CAD-CAM training; this was significantly related with CAD-CAM usage. Similarly, 76.0% of the staff lack competency in CAD-CAM technology, this was significantly related with CAD-CAM usage. Lack of leadership support and financial investment in CAD-CAM technology are some of the key issues impeding CAD-CAM usage. Leadership style in textile industries is weak, and does not have any mediating effect on CAD-CAM usage in the industries. Additionally, financial status has no significant influence on CAD-CAM usage. Multiple linear regressions were performed in determining the independent variables that were related to the dependent variables and to infer the correlational relationship. Six hypotheses were tested at $p<0.05$ alpha index, four out of the six were statistically significant; (availability of CAD-CAM program, $t=2.508$, $p< 0.014$; work experience, $t=4.524$, $p< 0.010$; CAD-CAM training, $t=13.179$, $p< 0.020$; and staff competency, $t=2.145$, $p< 0.039$), hence the study rejected them, while the two, leadership style ($t=0.083$, $p< 0.934$) and financial status ($t=0.249$, $p< 0.804$) were retained because they were not statistically significant. Finally, a CAD-CAM training model was developed from the result of the findings for the textile industries. The study recommends that textile industries, stakeholders and government should use the developed training model to improve workers' training and re-training capacity in CAD-CAM through Public Private Partnerships, (PPPs), with software developers through promotion and after-sale training. Industries leaders and government should invest in CAD-CAM technology to make it available for use.

CHAPTER ONE: INTRODUCTION

1.0 Introduction

This chapter presents the background to the study by shedding more light on Computer Aided Design and Computer Aided Manufacturing training, competency and usage in textile industries of Northern Nigeria. It also provides the problem statement, purpose of the study and the study's hypotheses. The study's objectives, significance, delimitation, limitation, assumption and the theoretical and conceptual framework are also explained.

1.1 Background to the Study

Textile, clothing and their production methods are as old as human history. However, over the years, the textile industry has seen a marked change owing to the mechanization and computerization at various stages. Computer Aided Design (CAD) and Computer Aided Manufacturing (CAM) are technologies used in digital computers to perform certain functions in design and production with greater efficiency, effectiveness, and precision (Dzikite, 2015). The textile industry has profited a great deal from CAD-CAM leading to better efficiency in good designs precision, colour selections and, more importantly, memory storage for future use (Silva & Rupasinghe, 2016).

Globally, the textile industry has witnessed not only remarkable innovation in technology but also the adoption of CAD-CAM in textile mass production (Mitra, 2014). The innovation has greatly changed the production phase in terms of speed, and reduces lead time and product finishing. The acceptability of CAD-CAM usage in textile production is far advanced in countries like USA, Britain, China, Italy, France, Japan, and Germany (Zhang, Kong & Ramu, 2014). CAD-CAM influence is also rapidly spreading worldwide to other emerging countries in Africa thereby opening new growth prospects in the textile industry (Kossaï & Piget, 2014).

In Africa, according to Fukunishi (2014), nations like South Africa, Tunisia, Mauritius, and Madagascar are ranked as the leading countries in CAD-CAM usage. However, a good percentage of textile and fashion industries in Africa are not able to apply CAD-CAM technologies due to several factors such as lack of software and knowledge of its application (Mado-alabi, 2014). According to Kamau (2012), the appropriate software for textile production is very limited in its use in Kenya. CAD-CAM requisite software packages were challenges confronting the textiles and clothing industries in Ghana (Adwoa, Eunice & Biney-adoo, 2014).

In Nigeria, the use of CAD-CAM in textile production is at a very slow pace due to lack of software and knowledge of its application thereby impeding efficiency (Onuoha, 2013). Even though the manually operated machines are being computerized and programmed to produce textile materials, there is little or no study that has provided data on CAD-CAM training, competency and usage in textile industries in the area under study.

The current government administration through the Federal Ministry of Industry Trade and Investment (FMITI) started some mock assessment on the state-of-the-art technology in the manufacturing sector (Onyeiwu, 2017). This, if done, would uncover the area where the textile industries need to step up in terms of technology level and training in the Nigerian production sector.

As important as the role of CAD-CAM may be, there seems to be inadequate skilled labour and expertise in the area of software application in Nigeria and Africa at large

(Pitan & Adedeji, 2012). The woven textile industries in Nigeria recorded a huge success in the 1980s generating up to the growth of 67%, and providing 25% of jobs for over a million people. However, as the world is moving towards technology driven era, there seems to be a disparity between most of the Nigerian textile industries' production techniques and the ones in most of the developed countries.

Studies show that Nigeria's over-dependence on oil, foreign expatriates, and foreign textile at the expense of technology driven textile industry and upgrade may be responsible for the low production (Kraak, 2015). Hence, the researcher intends to focus on the level of CAD-CAM training, competency, and usage in the textile industries of Northern Nigeria in order to develop a training model.

1.2 Statement of the Problem

In the past years, the textile industry in Nigeria flourished and provided revenue for the government (Makinde, Fajuyigbe, & Ajiboye, 2015). This trend has changed in the last 40 years as more of these industries have been shut down or production greatly reduced (Plankensteiner & Plankensteiner, 2016). Various scholars have attributed this change to cheaper competitive textile materials from other regions and poor managerial structures (Pitan & Adedeji, 2012).

There are paucity of studies that have looked into the production of these textiles industries using the more advanced technologies available in CAD and CAM. Additionally, there is little information on how training and competency correlate with CAD and CAM usage in textile industries of northern Nigeria. Furthermore, scholars have not looked into various organizational aspects that influence the use of these technologies and what appropriate training models would help enhance competency in the use of CAD and CAM in these industries.

This study therefore examined the training and competency of workers and how it correlates with CAD and CAM usage. Additionally, the study also assessed organizational leadership and financial status and how it influences the use of these technologies and what appropriate training models would help enhance competency in the use of CAD and CAM in these industries.

1.3 Purpose of the Study

The purpose of this study was to assess computer-aided design and computer aided manufacturing training, competency, and usage in textile industries of Northern Nigeria in order to develop a training model for CAD-CAM usage in the textile industries.

1.4 Objectives of the Study

The study was guided by the following objectives:

i. To identify the level of CAD-CAM training received and CAD-CAM usage in textile industries of Northern Nigeria.

ii. To examine the competencies of textile industry’s staff and CAD-CAM usage in textile industries of Northern Nigeria.

iii. To determine the relationship between work experience and CAD-CAM usage in textile industries of Northern Nigeria.

iv. To establish the relationship between the availability of CAD-CAM program and CAD-CAM usage in textile industries of Northern Nigeria.

v. To determine the organizational leadership influence on CAD-CAM usage in textile industries of Northern Nigeria.

vi. To ascertain the financial influence on CAD-CAM usage in textile industries of Northern Nigeria.

vii. To develop a training model for CAD-CAM usage in Textile Industries.

1.5 Research Hypotheses

Ho_1. There is no significant relationship between CAD-CAM training received and CAD-CAM usage in textile industries of Northern Nigeria.

Ho_2. There is no significant relationship between textile industry's staff competency and CAD-CAM usage in textile industries of Northern Nigeria

Ho_3.There is no significant relationship between work experience and CAD-CAM use in textile industries of Northern Nigeria.

Ho_4. There is no significant relationship between the availability of CAD-CAM program and CAD-CAM usage in textile industries of Northern Nigeria.

Ho_5. Organizational leadership does not significantly influence CAD-CAM usage in textile industries of Northern Nigeria.

Ho_6. There is no significant influence between the financial status and CAD-CAM usage in textile industries of Northern Nigeria.

1.6 Significance of the Study

The study has provided current data on CAD-CAM training, competency, and usage to textile industries. The findings from the study will help the textile industries CEO's and stakeholders to improve the state of CAD-CAM training techniques and skills among their workers.

The Federal Ministry of Industries Trade and Investment could use information from the study in developing policies that will guide in achieving Nigeria's Vision 20:2020 project.

The study findings can be used to develop a training model that will help improve CAD-CAM training for Textile Industries.

Finally, the study will also add to the existing literature on the use of CAD-CAM in the textile industry and will serve as a source of reference to other scholars when carrying out research in related fields.

1.7 Delimitations

This study was limited to CAD-CAM training, competency, and usage in the textile industries of Northern Nigeria with a focus on woven textile design industries. The CAD-CAD usage was limited to the production of textile fabrics. The attributes of the industries in the region under study are largely woven textile design industries.

1.8 Limitation

Generalization of the findings to other regions and types of industries should be done with caution since the study was centred on CAD-CAM training, competency, and usage in Textile industries of Northern Nigeria.

1.9 Assumptions

The study assumed that designers and technologists in textile industries of Northern Nigeria are aware of CAD-CAM programs. The study also assumed that the workers in textile industries under study are trained and competent in the use of the technology in textile production. Therefore, the respondents would be able to provide the necessary information needed for the study.

1.10 Theoretical Framework

This study is based on the systems theory deduced in the 1950s by Ludwig Von Bertalanffy. The theory was used by Kamau (2012) to assess the adoption of apparel computer-aided design technology training in selected public universities in Kenya. The theory integrates both holism and reductionism. Holistic approach views system behaviour as independent from the properties of the components, while reductionism says the law governing the components is what determines or causes the behaviour of the whole. The theory focuses mostly on the arrangement of the relations between parts and how they are connected with the whole (Hylighten &Jostling, 1992).

The way the parts are organized in a system and how they interact with each other determines its properties. An open system is made up of three vital elements: input, process, and output. This relates to how an industry receives resources such as equipment, natural resources, and the work of employees is referred to as input. The process is the financial strength of the industries and the kind of leadership that governs the industries. The interaction between these inputs or services is called output, which are released into the environment.

In this study, the organizational inputs can be seen as the independent variables (CAD-CAM programs, work experience, CAD-CAM training and CAD-CAM competences), processes are the moderating (financial status) and the mediating (leadership style) variables, while the output stands for dependent variables (CAD-CAM usage) in the study.

1.11 Conceptual Framework

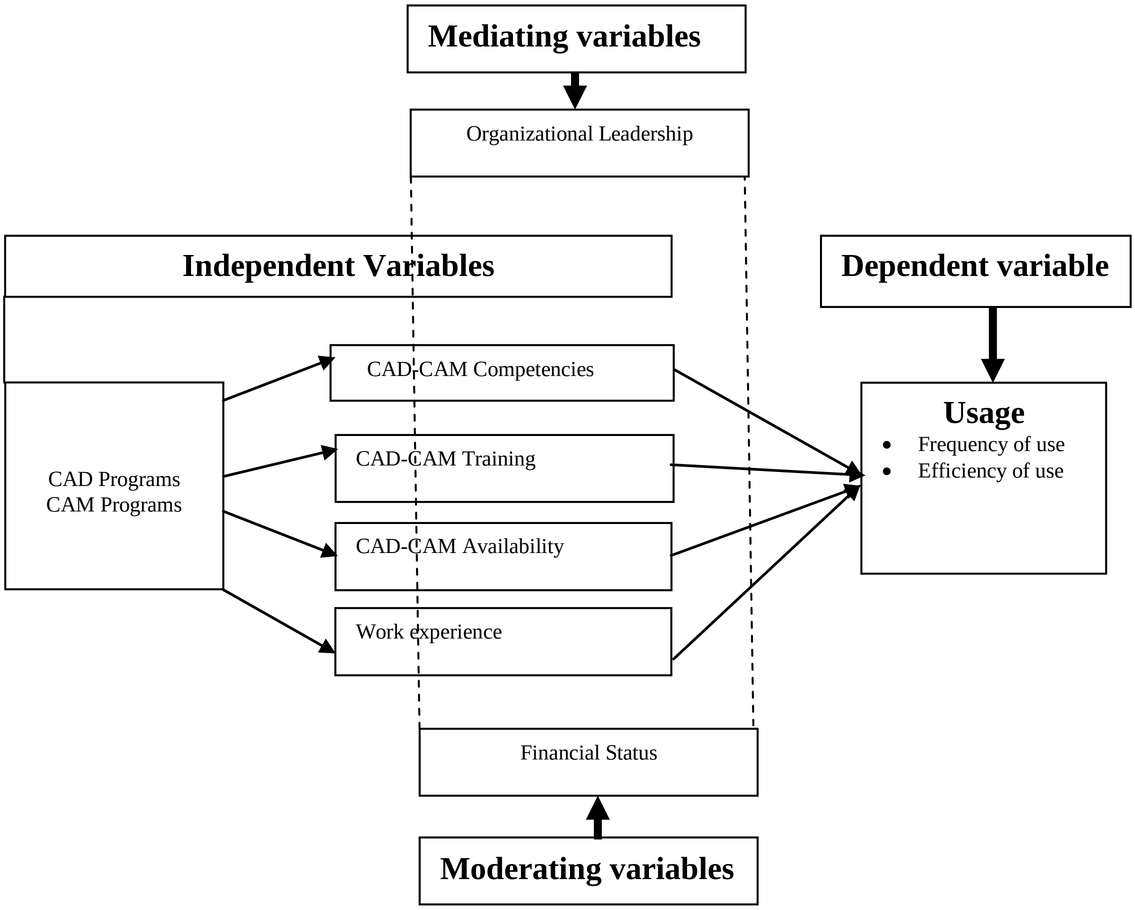

Figure 1.1: Conceptual framework

Source: Conceptual framework adapted from Kamau (2012)

From figure 1.1 the key components of the system theory are basically input and output. This study views the textile industries as a system which receives resources such as CAD-CAM program, CAD-CAM training program, CAD-CAM competencies and the interaction between CAD-CAM training and staff competency in CAD-CAM as input to give a high-level output as CAD-CAM usage (frequency and efficiency of use).

This chapter has discussed the background of the study and the statement of problem thereby high-lighting the under laying issues that surround the use of CAD-CAM technology globally, in Africa and Nigeria. The purpose of the study was also discussed as well as the significance of the study. System theory was used to show how the theory's components relate to each of the current study proponents and their connectedness. Finally, the study developed a conceptual framework which is a modified version from Kamau's (2012) conceptual framework.

CHAPTER TWO: LITERATURE REVIEW

2.0 Introduction

This chapter reviewed several related literatures in order of the study objectives. CAD-CAM programs, work experience, CAD-CAM training CAD-CAM competences, leadership style and the financial status of the textile industries under study. The study also summarizes the various literature reviewed and concluded the discussion.

2.1 CAD and CAM Technology

CAD is the use of technology in the design process which consists of specialized software (depending on the particular area of application) and peripherals which, in certain applications, are quite specialized (Mitreva & Taskov, 2014). On the other hand, CAM is a technology that aids in the manufacturing of a product with greater efficiency, effectiveness, and precision. According to Edelhauser (2014), CAD-CAM technologies are concerned with the use of computer software and hardware in various disciplines to perform certain functions in design and production with greater efficiency, effectiveness and precision for competitive advantage.

Globally, CAD-CAM has gained acceptance in industries since the early 1970s. In developed countries, CAD-CAM is used in the design for mass production and mass customization to boost production in the textile and apparel industry (Dzikite, 2015). Mao (2015) affirms that CAD-CAM technology is the third phase of the industrial revolution era of mass production. Hence, many developed countries are quick in applying CAD-CAM in most manufacturing sectors to build competitive capacity and a strong economy. CAD-CAM application by manufacturing industries covers a wide range of processes.

Countries like USA, Britain, China, Italy, France, Japan, and Germany have embraced these technologies in the various production processes such as designing, production, communication, retailing, advertising, and marketing of goods and services for product value addition (Zhang et al., 2014). These technologies are used as major tools in every human activity by many manufacturing industries. Their areas of application include automobile industries, textile and apparel, ceramic and glass industries for design and production (Ríos-Zapata, Osorio-Gómez & Mejá-Gutiérrez, 2014).

2.1.1 CAD and CAM in Textile

In developing and low-income countries, studies have revealed that South Africa, Tunisia, Mauritius, and Madagascar are ranked as the leading countries that use computer technologies to some level in design and production (Fukunishi, 2014). In Nigeria, several studies have revealed the need for CAD-CAM integration in textile production (David, 2015). This study, therefore, seeks to fill this gap by ascertaining the level of awareness of the CAD-CAM program in textile industries of Northern Nigeria. This study, therefore, seeks to fill this gap by ascertaining the level of awareness of the CAD-CAM program in textile industries of Northern Nigeria.

Suneel & Moulali (2016) document that CAD assists textile designers in simulating the complete life cycle of textile production from conceptual to parametric design; creation, testing, prototyping, modification, analysis and optimization of a design. Today, many textile industries have found the technology to be very suitable and flexible method for textile production thereby helping them meet the market target, quality, efficiency and competitive advantage.

In recent times, cumbersome traditional textile production processes are now made easier, faster, quicker and smarter by the use of technology (Dzikite, 2015). These technologies have brought a complete turnaround in the textile industries by aiding mass production, mass customization and shortening the product lead time with a focus on customer satisfaction and prompt delivery (Lazarevic, Cosic, Lazarevic & Sremce, 2014). Hence, the use of computer technology to perform some tasks in textile industries has become very crucial. The technology enables textile designers in designing new models, textile engineers at the garment development process and retailers of garments at performing their selling activities. However, these technological innovations and achievements cannot be ascertained in Nigerian textile industries, hence, this study aims at establishing the availability of CAD-CAM program in textile industries of Northern Nigeria.

CAD-CAM adoption in textile design by many industries was as a result of a search for suitable and flexible textile production methods to meet the market target, quality, efficiency and competitiveness (Najy, Padhye, Wang & Chatterjee, 2013). CAD-CAM technologies also enable visual presentation between clients and designers without any form of a physical prototype. Aesthetic design modification can quickly be carried out in response to the customer’s feedback and market changing demands. Hence, errors and material wastage associated with the traditional method is highly minimized (Prá, Machado, Del, Netto & Alegre, 2015).

The CAD program takes over the manual designing and creation of imprint process in the textile industry, while CAM programs the mechanical or manual manufacturing aspect. The CAM software needs to analyze the coded CAD design model before it can compose a proper set of fabrication instructions for the production. These technologies are moving in the direction of greater integration of design and manufacturing, two activities which are traditionally treated as a distinct and separate function in production form (Kaiser, Vogt, & Tilebein, 2015).

There is a high growing textile and apparel market globally. Therefore, the application of CAD-CAM by the developed countries indicates that the future of the textile and apparel industry depends on its usage (King, 2016). Sinha (2015) affirms that the Organization for Economic Co-operation and Development (OECD), documented textile and apparel as the biggest export, accounting for about US$610 billion and contributing 4.3% of the world's exports worldwide with China on the lead and followed by Hong Kong, Italy, Germany, the United States, and India.

According to experts' prediction, this demand will continually be on the rise. Thus, the employable capacity of the future lies with the textile industries (Ujiie, 2014). These aforementioned countries were able to achieve this economic and employable state as industries because of their effective and efficient use of CAD-CAM technology. However, this cannot be realized if developing and low-income countries continue to run on labour-intensive textile industries.

Fukunishi and Yamagata (2013) documented that in the whole of sub-Saharan Africa, only Madagascar can boast of having a viable textile market in the region. Fukunishi's (2014) study that compares Kenya and Bangladesh apparel industry revealed that lack of technology usage and persistent labour-intensive textile industries are the fundamental reasons for immiseration in the region. Fukunishi et al. (2013) reveal that Madagascar's viable textile and apparel market was as a result of high CAD-CAM usage.

Onuoha's (2013) account of West African textile and apparel market also concurs with that of Fukunishi (2014). However, Onuoha (2013) reveals that the huge population in West Africa was not properly utilized for strategic marketing advantage as used by Asian countries to build a strong competitive industry.

To juxtapose between West Africa and Asia, Onuoha (2013) further observed that the Asian countries made use of CAD-CAM technology to meet the internal demand/consumption of their huge populace. In contrast, a report by Advisory (2017) asserts that the textile industry in West Africa is lagging behind in meeting the vast demand of textile materials in the region. The competitive capacity is also a big challenge due to slow technology implementation (Adwoa, Eunice, & Biney-aidoo, 2014). Hamma-adama, Kouider, and Salman (2018) state that there is sufficient hardware in many establishments in Nigeria, but that they lack the available CAD-CAM software.

Additionally, study findings by Balogun, Otanocha, and Ibhadode (2018) observed that the CAD-CAM technology is gradually becoming available to fabricate parts in other production sectors such as construction firms although the level of its availability is yet to be ascertained. Hamma-adama et al. (2018) study on construction firms further found that there is a significant correlation between software availability and the implementation of CAD-CAM technology. This study, therefore, intends to establish the relationship between the availability of CAD-CAM program and CAD-CAM usage in textile industries of Northern Nigeria.

2.2 Computer Aided Design in Textile Design Processes

Textile design processes can be classified into three broad categories: Pre-fabric construction, fabric construction, and fabric decoration and finishing (Gausa & Ezra, 2015). However, for the purpose of this study, CAD usage was narrowed to design in woven textile design industries, because these are the types of textile industries under study.

Examples of CAD software used are Corel Draw, Photoshop, Adobe Illustrator, Textile vision, Arahne, Ned Graphics, Textronic, Pixel art, Eat design scope, Muller MCAD for woven textile design. These technologies have over 200 tools and utilities, sophisticated editing tools and creating different design sizes. They also have the ability to retain all technical details and unlimited colour palate customization, multiple Yarn layout specification (warp and weft yarn), exact alignment and fabric simulation. Although IT and CAD have developed over the years, it is not clear how many of this software are used in Nigeria. The study sought to establish the most common ones and level of the software application in the industries under study.

2.2.1 CAD Usage in Pre-fabric Construction

Pre-fabric construction involves ginning for seed removal, carding for blending the fiber and impurities removal, combing for improving yarn quality by removing short fibers, drawing for maximum evenness of fiber to required density, and spinning to make yarns (Rathnayake, 2015). All these processes are now handled by CAD technology such as Uster AFIS and Uster bale manager (Elahi, 2016). These processes can now be monitored via computer screens to ascertain the quality and maturity of the fibers and material simulations (Wien, Berufsbildung, Designpädagogik, & Pregledni 2014).

With this technology, varieties of thickness can be introduced as design during the yarn manufacturing depending on the simulated produced model and the end use. CAD enables the producer to easily monitor the twisting, sizing, and thickness of the yarns during the process for detection of any fault. The benefit of visualizing the physical characteristics of yarn on the screen during the design process is to help textile designers correct any design errors that may arise during or after production to avert material wastage. The technology also enables simulation of a 3D form of the materials, yarn structure and whitewash effects (Dzikite, 2016).

Fukunishi, et al. (2013) observed that despite the advantages of these technologies, textile industries in most developing and low-income countries are slow in embracing this technology due to the lack of technical know-how. Therefore the study intended to establish the influence of CAD usage in Nigerian textile processes.

2.2.2 CAM Usage in Pre-fabric Construction

Speedy production of quality textile and apparel at lower prices has necessitated the use of different techniques, to manufacture goods of any kind and remain competitive (Mitreva & Taskov, 2014). CAM as a computerized control in manufacturing is used in conjunction with CAD software for manufacturing of textile fabric (Nayak et al 2015). While the CAD handles the designing, the CAM helps to produce the exact product design.

According to Ali and Gwari (2011), the CAM technology is used in controlling the ginning process up to the yarn production stage. CAM application in the pre-fabric production process has helped in producing high quality ginned fibers, well-carded sliver for spun yarns (Alali, & Drean, 2014). The quality yarn can easily be determined whether it has met the required standard.

CAM application has helped in improving the industry’s efficiency (Massa, 2015). This was also reported by Fukunishi et al. (2013) that radical advancement in the spinning processes during the industrial revolution was as a result of high CAD-CAM usage in textile processes. However, studies revealed that the lack of investment in workers training is hampering CAD-CAM usage in Nigerian textile firms (Nayak et al., 2015).

2.2.3 CAD Usage in Fabric Construction

Fabric construction is defined as the process of converting textile fibers and yarns into fabrics (King, 2016). In the past, these processes were very tasking and usually time-consuming. Currently, CAD can produce multilayer structural designs, technical textile materials and present them in either 2D or 3D (Taylor & Chen, 2015). This has helped enhance the designer’s ability in analyzing the various complex woven structures in composite textile. There is no limit to what CAD can do in terms of woven design structure, yarn colours and material density (Elahi, 2016).

This technology also has databases that help in managing and archiving of all weaving data records for reproducibility (Taylor & Townsend, 2014). It permits the importation of new pattern data from various CAD programs as well as modification of the design. However, there is a paucity of documented information on this process (Massa, 2015, Zhang, 2014).

2.2.4 CAM Usage in Fabric Construction

In most textile industries today, CAM are used with power looms such as Doddy and Jacquard to monitor, control, regulate and optimize all the weaving process.

Commonly used CAM software for fabric construction includes; Scotweave, AVA, Textile vision and textronic (Sinha, 2015). Of course, many more are still developed for dynamism and flexibility of production. CAM's software capability is limitless; it can weave both simple and complex designs. The nature of the weave structures produced will depend on the coded CAD programs as well as the number of harnesses, the sequence of shedding and the shedding motion (King, 2016; Sinha, 2015).

CAM software provides high operational reliability via the use of centralized micro-processing control. This operation includes the electronically controlled warp let off, warp tension, cloth take-up, weft tension, selection of multiple colour wefts, cloth thickness, and also yarn controlled brake that reduces weft breakage thereby minimizing wastage (Elahi, 2016).

Machine program setting and weave design structure can easily be archived and be transferred digitally at any time. These systems offer the following benefits: shortening the resetting and cycling times, increasing efficiency and improving reproducibility (Rakesh, 2014; Akayeti, 2015; Dāboliņa, Viļumsone, Dāboliņš, & Strazdiene, 2017). However, studies in Nigerian textile firms addressed mechanization without addressing CAM usage (Olajide, Fajuyigbe, & Ajiboye, 2015).

2.2.5 CAD Usage in Fabric Decoration and Finishing

The process of fabric decoration includes surface and structural design thus, dyeing, printing, and packaging (Gausa et al., 2015). Studies have been carried out on CAD usage in fabric decoration and finishing (King, 2016). In spite of the documented studies, there is limited research on the level of CAD in this area. Additionally, Kossaï and Piget (2014) cited that there is lack of CAD process in fabric decoration and finishing, thus justifying the need to establish CAD usage in fabric decoration and finishing in Nigerian textile firms.

2.2.6 CAM Usage in Fabric Decoration and Finishing

Textile industries through CAM usage can produce a variety of decorated fabrics with reduced real time. These decorated fabrics include those for apparel, furnishing, technical textiles and signage textiles (Johanna, 2016). Modern machines such as automatic flatbed screen printing, laser jet printing, circular printing, and digital inject printing are now used in conjunction with CAM software (Macbeth os, Datacolor os) that helps in controlling the printing process (Nayak et al., 2015).

With digital textile printing, a long sequence of printing processes such as repeat size, colour types, colour separation and use of colours can be easily done (Mitra, 2014). The textile designer can now print single production or small batches without a pre-production process for print-on-demand. The CAM technology offers a variety of new possibilities that enable mass customization of textile fabrics with intricate design print such as 2D and 3D design prints (Carlsson, 2016).

Empirically, these new production methods have been identified to be most environmentally friendly with sustainable qualities, because it does not pollute the environment like the other six- coloured rotary printer that uses different chemicals such as ammonium sulphate (Johanna, 2016). Johanna further documents that digital textile printing is reliably less wasteful, fast and has minimum power consumption with improved productivity for global competition.

Adwoa et al. (2014) assert that the Nigerian domestic textile industries can effectively compete well with imported textiles if only they apply these technologies in textile production processes. However, several studies have shown that the absence of this technology usage has impeded the production capacity of many developing and low-income countries with no competitive strength (Chepchumba, Susan, David, Tuigon, 2014). Preliminary studies have shown that scanty or no research has been conducted to provide data on use of CAD-CAM technology in Textile industries of Northern Nigeria. Hence, this study intends to establish the level of CAD-CAM influence in different production processes used in the area.

2.3 Work Experience

Work experience refers to the number of years that staff spends in an organization. The longer a staff works in an institution or organization that uses CAD-CAM, the more advantageous it is for him or her to use CAD-CAM technology. A study conducted by Staritz and Frederick (2016) reveals that the skill gap between expatriate and local workers in Kenyan's textile and apparel is very small compared with other Sub-Saharan Africa countries. The study also indicates that the large number of locals in Kenyan textile industries can be attributed to the long history of an apparel industry that has produced workers with many years of experience, and the availability of local training institutions. Chwastyk and Kołosowski (2014) also reveal that many years of experience is associated with efficient and higher production.

A study by Ghavifekr, S. & Rosdy, W.A (2015) reveals that there is a relationship between work experience and effective use of technology in institutions of learning. This means that the longer a worker stays in an organization working, the more proficient the worker would be. The findings from Ghavifekr et al. (2015) also agreed with Ocampo, Hernández-Matías, & Vizán (2017) whose study on the work experience of textile industries in central America revealed that there was a significant percentage of people who had more than 20 years of experience and who showed competency in the CDA-CAM usage. Hence, the study intends to determine the relationship between work experience and CAD-CAM usage in textile industries of Northern Nigeria.

2.4 CAD-CAM Technology Training

The progress of a nation is a function of the level of the resourcefulness of the people which, to a great extent, relates to the quality of the training (Bukar & Timothy, 2013). Chepchumba, et al. (2014) defines training as ways of thinking and acting that workers lack or which causes them to perform below the desired standard. Technological developments of any kind only call for increased educational levels of the workers and continuous retraining, to acquire new skills necessary to fit into the industrial processes (Atsumbe, et al., 2014; Kossaï, et al., 2014; Isika, 2014).

A study conducted by Omondi, Imo and Otina (2016) on Kenya’s tertiary institutions’ CAD-CAM training indicates that the training of CAD-CAM technology received by the current students did not adequately match the labour market requirement in the textile industry. Hence, procurement of CAD-CAM technology is not enough when there is no deliberate investment in the areas of human capacity training, decentralization of the decision-making process, quality managerial practices and organizational changes (Dzikite, 2015).

A study by Yixian, Qihua, Xuan, and Kongde (2014) revealed that China has been investing in the training of CAD-CAM technology through institutional collaboration and technology upgrade in most of their textile industries. Most textile industries in developed countries are constantly investing and upgrading research and development, staff training institutes/colleges. In China, the criteria for becoming a middle age manager is the minimum of a master’s degree in CAD-CAM (Zhang, et al., 2014). This suggests the need for training to keep pace with technological changes. Hence the study intends to establish the level of CAD-CAM training in the textile industries of Northern Nigeria.

The triple helix innovation model is currently adopted by most textile industries for training in Nigeria. The model comprises of some set of interaction between the government, industry and academia. The Nigerian government provides funding to Industrial Training Fund (ITF) board which serves as a form of collaboration between tertiary institutions and industries for training of students and verse visa. Each of the three components of the model provides the following services. The government where the government provides the finances formulates policies towards state-of-the-art supports as well as advisory service, while the academia research and development, training and spin off. The role of the industry as shown on the model is for entrepreneurial venturing product manufacturing and services development.

Several studies have shown that the model has provided a good support to the training need of most industries’ technology (Fadeyi, Maresova, Stemberkova, Afolayan, & Adeoye, 2019; Muyiwa, 2019; Yixian, Qihua, Xuan, and Kongde, 2014). However, the question is to what extend has the training model been able to improve the industry's workers' competency in the use of CAD-CAM. Because, the study has also found that there is lack of training collaboration with software developers. It implies that the model is not properly addressing the aspect of informal training sector.

Zhang (2014) further stresses that most industries in China and India are giving topmost priority to training in CAD-CAM technologies to cut down future cost in production. Prioritizing CAD-CAM training by these countries has shown their preparedness to adopt new ideas and technology for improved productivity and competition. However, it is empirically reported that the employees of textile and apparel industry in developing and low-income countries lack formal training with the high level of incompatible skills (Bello & Inyinbor, 2013; Wangwe et al., 2014; Staritz & Frederick, 2016).

Kisato (2014) also opines that only highly educated person would stand a better chance of manipulating technological advancement in the fashion enterprises. Kisato's (2014) finding also agrees with that of Hamma-adama, Kouider, and Salman (2018) which states that there is a relationship between the level of training and CAD-CAM usage. This gap justifies the need to identify the level of CAD-CAM training received and CAD-CAM usage in textile industries of Northern Nigerian.

2.5 Textile Industry Staff Competency in CAD-CAM Program

Competency is the skill an industry needs to make a difference in the production of textile materials for export purposes (Ibeagha & Onwualu, 2015). This can be measured by the level of workers' technology performance in production with an improved value chain and value systems (Mboya & Kazungu, 2015).

The scope and depth of skills required for industrial development and economic growth need a daily upgrade. In recent times, the production of textile and apparel materials has become more advanced. Textile industries need to maximize their effort to develop the competency level of their workers through practice and exposure to CAD-CAM packages in the work environment for efficiency and growth (Omondi, et al., 2016).

Goedhuys, Janz, and Mohneny (2014) observe that competencies are sector specific and they are the drivers of innovation and technological change. For textile industries to withstand any form of competition, the workers must possess at least a certificate or diploma to show that they are skillful and also have technical know-how in evolving technology needed for production. Hence, there is a need for one to be acquainted with advanced automation in design and production (Alali & Drean, 2014).

Mboya, et al. (2015), opine that competency requires training, and management willingness to change by improving the workers skills for better industries performance. Top managers in textile industries need to be flexible in thinking, training, and technology upgrade (Bhaskaran, 2016). Hence, developing countries need to prioritize technology training amongst workers for skill upgrade.

Fakunishi (2014) stresses that the bulk of textile and apparel industries' workers in the East African region are characterized by unskillful personnel who are lacking in technological innovative skill. A study conducted by Kisato (2014) on utilization of e-marketing tools and influencing forces on the performance of micro and small fashion enterprises in Nairobi County, Kenya, revealed that most popular and older technology tend to have many users than those with latest and advanced technologies. This means that people tend to have some level of competence in older software when compared to the newest technology.

Ezeji (2018); Wasike and Ogollah's (2014) findings on CAD-CAM competence also showed that there is a significant relationship between the level of CAD-CAM competency and usage in most institutions of learning in the south-eastern part of Nigeria. In spite of this need, there seems to be a literature gap on the worker's competency in textile industries of Northern Nigeria. This study, therefore, intends to examine the competencies of textile staff and CAD-CAM usage in textile industries of Northern Nigeria.

2.6 CAD-CAM and Production

The production of any kind can only be determined by the level of effective use of production technologies and frequencies of its application. Erigbe, Ilori, and Adekunle (2016); Kelani, & Gado (2018) indicate that training in innovative technology is directly related to industrial productivity. They further noted that productivity does not occur by chance, but as a result of workers training in relevant technology and other inherent variables. Cruz, Guambe, Marrengula, and Ubisse (2014) revealed that CAD-CAM technology usage and training are of great significance in boosting production. Singleton (2013) opines that for a country to achieve a competitive advantage, it must be able to get a significant share of the exports of a certain product.

As such, many developed countries and Asian tigers are using CAD-CAM in boosting their production capacity to dominate the textile and apparel market globally. Technology is continuously changing. Hence, there is need to upgrade the quality of knowledge to keep pace with these changes (Rakesh, 2014). Lack of updated knowledge of the task in new technology can be an impediment to productivity (Erigbe te al., 2016; Foley, Watts, & Wilson 2018).. Employees, therefore, need a knowledge upgrade to reduce the widening production gap among developing and low-income countries.

Three major problems have been identified as the major challenges confronting the textile and apparel producers in developing textile and apparel industries. These are the inability to produce on a large scale, competitive prices and satisfying quality standards (Starovoytova et al., 2015). This is because the industries are yet to embrace and incorporate the use CAD-CAM technology

In Africa, Ogundele, Chete, Adeoti and Adeyinka (2014) also note that there is low production due to a low capacity utilization of digital technology, thus undermining the mass production of export quantity. A study conducted by Erigbe et al. (2016) in Nigeria, shows that there is a need for employees to have knowledge of task and productivity. Massa, (2015); Dāboliņa et al. (2017) also observed that there is the need to assess the employee's knowledge of relevant technology in textile firms. Hence, this justifies the need to study CAD-CAM usage in the textile industries of Northern Nigeria.

2.7 Leadership Style of Textile Industries

There are several competing definitions of leadership depending on the discipline and angle that one is looking at it. Nanjundeswaraswamy and Swamy (2014) assert that leadership is a process of social influence that maximizes the effort of others and resources towards achieving some certain organizational goals. These include sound and difficult decisions making process, creating and articulating a clear vision, establishing achievable goals and providing followers with the knowledge and tools necessary to achieve those goals (Katumbi & Musembi, 2018; Schepers, Wetzels and Ruyter, 2005)

According to Mason (2018) leadership style is a pattern of behaviour, assumptions, attitudes or traits exhibited by an individual in attempting to provide leadership. Mann (2013) emphasizes that a good leader should possess these four basic qualities in order to achieve organization's goals; an interpersonal relationship with his workers, workers motivation, organizational strategies and efficient way of production. Although there are different styles of leadership, however, it has not been ascertained whether leadership style in textiles industries aimed at working towards achieving the goals of their industries through the use of technology has a significant impact on productivity.

Nyamboga, Gwiyo, Waweru, and Omwario (2014) opine that the success or failure of any organization depends largely on the leadership style of the organization. Monari (2017); McCarthy (2015) opine that the increase in organizational Profit, Innovations, Quality, Satisfaction, and Productivity are the function of the leadership style, use of available resources and good working environment. Hence, the application of technology of any form in textile industries solidly depends on whether the leadership of the industry is interested in it or not.

According Bhaskaran (2016); Mboya et al. (2015) top managers in textile industries need to be flexible in thinking, use of innovative technology, organization policies, willingness to change in improving workers training and skills, technology upgrade and sourcing of expert to man the technology. Manage, Asil and Naralan (2016) assert that poor leadership style, non-dedication, employment of staff on the basis of mediocrity are the major reasons for lack of sufficient knowledge and experience among workers and stand as the major barriers to CAD-CAM usage in most textile industries.

However, in Nigeria, most studies have not focused on the influence of leadership style in Nigerian textile industries. Nanjundeswaraswamy and Swamy (2014) reveal that leadership style was found to have a significant mediating relationship on advanced technology usage. Additionally, a study conducted on the Impacts of organizational technology competence and leadership styles on the innovative application for the industry in Taiwan by Hsien-Che Lee and Yi-Wen Liu (2008); Ismaila , Sulu and Adams (2017) found that leadership style has a positive relationship on the organizational innovative application, and the leadership style mediates the relationship between organizational technology competence and organizational innovative application.

Technology support, training, leadership-style, and attitude can stimulate awareness of technology and eventually result in its usage (Scheper., Wetzels., & de Ruyter.,2005). Lu Ye, Deng Junye and Ma Yan (2011) studied the relationships between Leadership Styles and Organizational Innovation Climate whose result revealed that employees' perceptions on the transactional or transformational leadership style of executive are both positively correlated with perceptions about executive's encouragement factors of its innovation environment (Zorn & Violanti,1993). Consequently, there is the need to determine the organizational leadership influence on CAD-CAM usage in textile industries of Northern Nigeria.

2.8 Financial Status of the Industries

The work of industries' executives includes planning, organizing, staffing, leading or directing, and controlling an organization to accomplish the goal. Resourcing involves the consolidation of human resources, financial resources, technological resources, and natural resources towards achieving industry expected goals. The application of CAD-CAM technology by most organizations varies from one industry to the other depending on the size of the organization as well as the financial strength. Asil & Abdullah (2016) assert that management functions such as planning, organizing, staffing, directing, and controlling are not done properly in many industries.

Makinde, Fajuyigbe and Ajiboye (2015) observe that the applications of these functions are fundamentally management dependent. Asil and Abdullah (2016) observe that poor management of resources such as funds, delays in the decision-making process, lack of sales due to poor quality of goods and services, poor planning that could enhance mass production and profit index are among the issues that impede the path of growth and development of most industries.

According to a report by the Organization of Economic Co-operation and Development (OECD, 2018), innovative digitization, technology usage, and needed expertise cannot be possible without deliberate effort by the organization towards investments. Munjal, Requejo and Kundu (2018) explored the impact of firm financial status on technology usage and staff competency and observed that there were positive effects of technological knowledge and staff competency on technology usage.

2.9 Summary of Literature Reviewed

This chapter reviewed related literature according to the objectives of the study. After a thorough review of the literature, it was observed that different scholars have indicated eminent contribution on the use of CAD-CAM technology globally, in Africa and also in Nigeria. However, the following are the major gaps that this study has identified;

i. CAD-CAM technologies are important tools in every human activity by many manufacturing industries. Several authors have written about the use of CAD-CAM technology in areas such as automobile industries, engineering, communication industries, and educational institutions and medical science, ceramic and glass industries for design and production (Ríos-Zapata, Osorio-Gómez & Mejá-Gutiérrez, 2014). However, there are little or no studies on the availability of CAD/CAM technology in the Northern Nigeria's textile industries as a result; this study intends to look into the availability of CAD-CAM program and CAD-CAM usage in textile industries of Northern Nigeria.

ii. CAD-CAM technologies are constantly being modernized, hence the call for increased in the educational levels of the workers and continuous retraining, to acquire new skills necessary to fit into the industrial processes (Atsumbe et al., 2014; Kossaï, et al., 2014; Isika, 2014). Various scholars have discussed the importance of training as a key factor in improved CAD-CAM usage in most manufacturing industries. A study by Yixian, Qihua, Xuan, and Kongde (2014), revealed that China and many developed countries were able to train some of their workers in CAD-CAM technology through collaboration between industries, government, training institutions, and software developers.

Although in Africa and Nigeria, there are studies on different modes of training that exist among workers in other manufacturing sectors, there seem to be limited studies on CAD-CAM training in textile industries of Northern Nigeria. Additionally, there are little or no studies that show whether the Nigerian textile industries are collaborating with government, training institutions, and software developers. Hence, there is the need to identify the mode of CAD-CAM training received and CAD-CAM usage in textile industries of Northern Nigeria.

iii. Goedhuys, Janz, and Mohneny (2014) observe that competencies are the drivers of innovation and technological change. Ezeji's (2018) findings on CAD-CAM competence also showed that there is a significant relationship between CAD-CAM competency and ‘usage. Most of the studies in Nigeria are on other industrial sectors and few on institutions of learning in the south-eastern part of Nigeria. There appeared to be a dearth of studies on the worker’s competence in textile industries of Northern Nigerian, hence this study, therefore, intends to examine the competencies of textile industries’ staff and CAD-CAM usage in textile industries of Northern Nigeria.

iv. Furthermore, a number of studies have indicated that years of experience are associated with the frequency and efficiency of technology usage. This means that the longer a worker stays in an organization, the more proficient the worker would be. Studies in many countries show that the more a worker had many years of work experience, the more the frequency and efficiency of CAD-CAM usage in textile industries of Northern Nigeria would be. But there are no studies on textile industries that show how one's years of experience impacted on the use of CAD-CAM technology. This study, therefore, intends to provide new insight into the relationship between CAD-CAM technology usage and one’s years of experience.

v. According Bhaskaran (2016); Mboya et al. (2015), top managers in textile industries need to be flexible in thinking, use of innovative technology, organization policies, willingness to change in improving workers training and skills, technology upgrade and sourcing of expert to man the technology. Manage, Asil and Naralan (2016) assert that poor leadership style is one of the major reasons for lack of sufficient knowledge and experience among workers to use the CAD-CAM technology. Despite the influence of leadership style on the use of technology industries, in Nigeria, most studies have not focused on the influence of leadership style in Nigerian textile industries. Consequently, there is the need to determine the organizational leadership influence on CAD-CAM usage in textile industries of Northern Nigeria.

vi. Several studies have revealed that most industries in Nigeria are poorly funded and lack investment capacity in CAD-CAM technology (Olajide, Fajuyigbe, & Ajiboye, 2015). Gaith, Rashid, and Ismail (2012) observe that many industries lack adequate budgets for CAD-CAM technology; as a result, it has hampered the level of usage in the industry. From the literature reviewed there is no study in Nigeria that clearly shows whether the organizational financial status has any influence on the use of CAD-CAM technology. Hence, there is the need to ascertain the organizational financial influence on CAD-CAM usage in textile industries of Northern Nigerian.

vii. Finally, researchers have made some effort in investigating and providing a solution to the use of CAD-CAM technology in Nigeria. However, there appears to be none that has developed a training model that would be used for CAD-CAM technology training in textile industries of Northern Nigeria. Consequently, this study intends to develop a training model for CAD-CAM usage in Textile Industries.

2.10 Conclusion

This chapter has reviewed various related literature on the objectives of the study. The studies were used to show other scholarly studies that have carried out on CAD-CAM. These studies have helped in providing a deep insight into the problem of the study and also enrich the research as well as establish gaps that need to be filled as provided in the summary of the literature reviewed.

CHAPTER THREE: RESEARCH METHODOLOGY

3.0 Introduction

This chapter discusses the research design and the types of variables used. The study area, population, sampling techniques and sampling size, data collection techniques, data analysis and presentation, logical and ethical issues were also discussed.

3.1 Research Design

The study used a cross-sectional descriptive survey to collect data from the respondents. The study has considered qualitative, quantitative and mixed methods, but qualitative and mixed methods were not so ideal because they are capital intensive and time consuming. The experimental design falls short because of the component design hence, the choice for the cross section descriptive design. A cross-sectional descriptive survey was chosen because it enabled the study to gather useful data at one point by assessing the level of computer-aided design and computer aided manufacturing training, competency, and usage in textile industries of Northern Nigeria within a given population at a particular time.

Additionally, the cross-sectional descriptive survey would help the study to make inferences about relationships that exist among variables. This design allows the collection of quantitative data from the population under study at the lowest cost (Freytag & Young, 2018; Creswell, 2014). Cross-sectional studies help the researcher to investigate whether significant association among variables exist at a specific point in time. In addition, Saunders, Lewis and Thornhill (2007) also noted that this research design is recommended by scholars because it permits both descriptive and inferential statistics to be conducted in data analysis.

3.2 Measurement of Variables

The current study examined four important variables; independent, mediating variables, moderating variables and dependent variables (See Figure 1.1). Independent variable is what the researcher manipulates while the dependent variable is the outcome variable which is influenced by the independent variable (Kothari & Gaurav 2014; Creswell, 2014).

3.2.1 Independent Variables

This study's independent variables include the availability of CAD-CAM program, work experience, CAD-CAM training, and staff CAD-CAM competency. A five-point likert scale was designed with the aim of gathering information from the respondents on the availability of CAD-CAM program in the industries. The scale comprised of constructs on respondent's awareness, availability, and application of the software programs in the industries. Work experience was measured by asking the respondents to indicate the number of years spent designing in the industries.

CAD-CAM training was measured by asking respondents to indicate from the five-point likert scale options whether they have had any CAD-CAM training, the types of training received and the level of certification obtained in the training. CAD-CAM competency was also measured using a five-point likert scale where respondents were asked to indicate their level of competency in ten different items on CAD-CAM programs.

3.2.2 Mediating Variables

Mediating variables are the variables that stand between the independent and dependent variables, and they mediate the effects of the independent variable on the dependent variable. A five-point likert scale was used to elicit information from the respondents (designers, technologists and COE's) on the mediating variables (leadership style of the industry) with regards to CAD-Cam usage.

3.2.3 Moderating Variables

Moderating variables are independent variables that affect the direction and/or the strength of the relationship between independent and dependent variables (Thompson, 2006). A five-point likert scale was used to measure the effect of the moderating variables (financial status of the industry) with respect to CAD-CAM usage

3.2.4 Dependent Variable

The dependent variable in this study was assessed by determining the level at which the CAD-CAM program is utilized by the industries. Respondents were asked to rate each CAD-CAM program on a five-level likert scale to determine the frequency of use, and efficiency of use.

3.3 Study Variables and Characteristics

The study variables used in the study were tabulated in order of their characteristics as shown in table 3.1

Table 3.1 Show the variables and characteristics that were involved in the study

S/N	Types	Study Variables	Characteristics
	Independent	CAD-CAM training	Training received, informal training in CAD-CAM on the job, formal training CADCAM, Industries collaborated with institution for the training and software developers, highest certification level in CAD-CAM
	Independent	CAD-CAM competency	Lectra, textile vision, AVA, pro-design pro-weave, Corel draw, prima vision, adobe illustrator, adobe photo-shop, scotweave,
	Independent	Work experience	CAD-CAM working experience
	Independent	Availability of CAD-CAM program	Awareness of CAD-CAM program, availability of CAD-CAM software, use CAD-CAM program
	Moderating	Leadership style	Leadership support the use of CAD-CAM, leadership is CAD-CAM flexible, leadership is technologically innovative in CAD-CAM, leadership support CAD-CAM training, leadership employ CAD-CAM, expert
	Mediating	Financial status	**Production** (use CADCAM for mass production, quality of goods produced with CADCAM) **Sales**(level of sales, the capability of exporting products) **Profit** (sufficient financial resources for using CAD-CAM, invests enough money to buy the needed CAD-CAM technology)
	Dependent	CAD-CAM usage	The frequency of use and efficiency of use

Source: Researcher's Survey (2017)

3.4 Study Area

The study was carried out in the Northern part of Nigeria. This area of the study was chosen because it was the first part of the country where textile industries were established in 1957. The region comprises of about nineteen states, five out of which are the major textiles industrial sites (Kaduna, Kano, Katsina, Plateau and Zamfara). The study purposively selected Kano and Katsina only because, according to preliminary survey census carried out by the researcher in January 2018, Kano and Katsina states were the only states with functional textile industries (Appendix G). Besides, the level of insecurity posed by the Shiite group on the Northern part and herdsman on the southern part makes it inappropriate to conduct the study in Kaduna state.

3.5 Target Population

The target population included eight textile industries, one from Katsina state and seven from Kano state, because most of the industries had closed down and only eight were operational as at the time of the study. The study targeted the eight industries' CEO's, 58 designers and 86 technologists were also included totaling 202 persons. All these target population were drawn from the only functional textile industries in the region.

3.5.1 Inclusion Criteria

This study included woven and printed textile design industries whose staff strength is 200 and above. The respondents targeted were CEO's, designers, and technologist and were believed to provide valid responses towards achieving the set objectives in this study and their inclusion was critical to accomplishing it. Industry COE's were included because it was assumed that they are the ones who determine the type of technology to be used in the industries.

3.5.2 Exclusion Criteria

The study excluded industries who are not into woven and printed fabric production and whose staff strenght is less than 100 persons. Also, members of the administrative staff and other workers who are not into design and production of fabrics were excluded from the study because they are not directly involved in the use of CAD-CAM program.

3.6 Sampling Techniques

Stratified sampling technique was used to divide the units of analysis (those in dept. of fabric design, production and head of the industries) into strata such as CEO's, designers and technologists. These strata reflect the true proportion of the population of individuals in the textile industries. Census sampling was used in selecting the eight CEO's because there are only eight functional textile industries in the region that can provide vital information.

Random table numbers were used to sample the 58 textile designers and 86 textile technologists. A random number table was downloaded online, then each staff was assigned a number from 1 to 194, since there are population of 194 and 194 is a three digit number; the first three digits numbers was used as listed on the chart. The number was chosen randomly at any point on the chart until the researcher got a match as well as the desired sampled size.

3.7 Sampling Size

The sample size was determined by the use of Yamane's formula (Ismaila, Sulu & Adams, 2017, Israel, 1992). The use of this formula was well advocated when the population of the study is already known. Hence, this study utilized the Yamane's formula because the population size is already known to be 194 textile designers/technologists and eight textile industries CEOs in the two selected states (National bureau of statistics (NBS) 2018 data).

The formula states as follows:

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

Where n - Sample size (that will be determined)

N - Population size of designers and technologist (194) e - Sampling error level of 0.05 (confidence interval level of 95%)

n = $\underline{194}$

$1 + 194(0.05)^{2} = 131$

Therefore, n = 131 Respondents

10% of 131 for non-respondents were included in the sample size (Creswell, 2014) = 13.1 ≈13, hence, 13+131 + 8= 152.

The study, therefore, sampled 138 participants from the textile industries. Proportionate sampling technique was used to distribute sample size among the eight textile industries as described in table 3.2. The industries are categorized according to their staff strength. Those with more staff strength were arranged in the table in a descending order. Industry one has more staff so it was numbered as 8, two as 7, three as six, four as 6, five as 5, six as 4, seven as 2, and eight as 1 in an ascending order. Each number was divided by the sum of the entire number multiplied by sample size (144) to arrive at proportion distributed in the table 3.2

Table 3.2 Sample size of respondents in each textile industries

Numbers of Industries	Designers	Technologists	Total No.	%
1	13	19	32	22
2	11	17	28	19
3	10	14	24	17
4	6	10	16	11
5	5	7	12	8
6	3	5	8	6
7	2	2	4	3
8	8	12	20	14
Total of respondents	58	86	144	100

3.8 Research Instruments

The instruments for data collection were self-administered questionnaires for the CEO’s, designers and technologists (Appendix B & C). The self-administered questionnaire is deemed appropriate for collecting quantitative data because it is the most suitable and economical way of collecting numerical data from respondents to test hypothesis and occurrence in a large geographical area (Kothari, 2004).

3.8.1 Questionnaires

The questionnaire is one of the methods of collecting primary data from respondents. This study utilized questionnaires because it is the fastest and easy method of collecting information from a large number of respondents (Creswell, 2014; Kombo and Tromp 2009). The choice of this research instrument is because of its flexibility which worked well with a cross-sectional descriptive survey design of the study. The questionnaires used in the study consist of a series of questions, each addressing a particular study objective.

3.9 Pre-testing of Instruments

The instruments were pre-tested on a sample of textile industries’ workers. But these samples were excluded in the final sample to avoid contamination of the final study results as well as to evade variance in the measurement of the variables. The pre-testing was conducted on 15 respondents sampled from the textile industries to examine the accuracy and suitability of the instrument and establish the appropriateness of the methodology. The participants used in the pre-testing include one CEO and 14 designers/technologists as shown in table 3.3.

The essence of the pre-test was to ensure that both the face and content validity of the instrument are certified. Feedback from the pretest was used to refine the questionnaires by clarifying ambiguous questions, eliminating redundant ones and missing data from the respondents. This helped the researcher to project the average completion time of the questionnaire.

Table 3.3. Pre-Test Sampling Frame of the Respondents

industries	**Respondents**			**Total**
	Designers	Technologist	CEO	
1	3	5	0	**8**
2	3	3	1	**7**
Total	**6**	**8**	**1**	**15**

3.9.1 Validity of Instruments

The validity of an instrument refers to the degree to which the instrument measures what it is supposed to measure (Kothari & Gaurav 2014). Validations of the instruments were done using both content and face validity. While face validity is concerned with the appearance of the instrument, content validity refers to how an instrument adequately covers the content being measured. The content validity was established based on the research objectives with the guidance of the supervisors and two experts in the Department of Technology Education and Industrial Design Textile option, Modibbo Adama University of Technology Yola, Nigeria. These specialists helped in improving the validity of the instruments by providing comments on the suitability of the instruments in measuring the study variables. Face validity was ensured through the clear and concise wording of questionnaire items and relatively short statements.

3.9.2 Reliability of Instrument

Reliability of the instrument refers to the degree of consistency or accuracy of the instrument in measuring the attribute it has been designed to measure (Polit & Hungler, 2013). The result obtained was analyzed and correlated using Cronbach alpha to measure a set of items' internal consistency. DeCoster (2001) and Yu (2011) state that a coefficient of 0.70 or higher is considered appropriate Cronbach Alpha value.

A Cronbach Alpha test of reliability was completed on the six variables (availability of CAD-CAM program, work experience, CAD-CAM training, Competency of staff in CAD-CAM Leadership style and financial status) used as indicators of usage in textile industries of Northern Nigeria. The reliability of the entire research instrument was computed based on the consistency of items. A coefficient of 0.852 for 30 items was obtained, showing that the instrument was reliable and acceptable at 0.70 thresholds. These results are summarized in table 3.4

Table 3.4. Cronbach's Alpha Reliability Statistics

Variables	No of Items	Reliability	Remark (Above 0.7 is Reliable)
Availability of CAD-CAM program	3	**.734**	Reliable
Work experience and CAD-CAM usage	1	**.733**	Reliable
CAD-CAM training and CAD-CAM usage	5	**.985**	Reliable
Competencies of staff in CAD-CAM usage	10	**.839**	Reliable
Organizational leadership	5	**.822**	Reliable
Organizational financial status	6	**.872**	Reliable
Overall Reliability	30	**.784**	Reliable

Results from table 3.4 show that all the results of the tested items were above Cronbach alpha coefficient threshold of 0.70. This implies that all the variables are reliable.

3.10 Data Collection Techniques

The data collection was done by four research assistants. Each of them had Bachelor's degree in Textile Technology. The rationale for the choice of assistants was to help the respondents in answering the questionnaire as well as ensuring data collection within a short period of time. Two day training was organized by the researcher to train the selected research assistants on how to administer the questionnaires. Subsequently, a mock data collection exercise was done at the end of the training to establish how well the research assistants had acquired the data collection techniques.

The researcher also secured research permission from Kenyatta University, Nairobi, Kenya, to proceed for data collection. Approval was then sought by the researcher from the Federal Ministry of Industry Trade and Investment. Similarly, authorization was sought from the various textile industries using the introductory letter from the Nigerian Federal Ministry of Industry Trade and Investment. Furthermore, an introductory letter was attached to the questionnaire, clarifying the purpose of the research and anticipated benefit to textile industries practitioners, government and academic circles.

The participants' consent was sought as indicated in appendix (A) and only those who agreed to participate in the research were involved. The researcher regularly cross-checked the data collected for clarity, during the data collection period. The respondents were assured of the privacy of their information and informed that the findings were purely for research purposes.

3.11 Data Analysis and Presentation

This section comprised of the study's analytical framework, justification and the anticipated result of the study which were analyzed in the order of the objectives.

3.11.1 Data Analysis

Statistical Package for the Social Sciences (SPSS) version 20 was used to analyze the quantitative data. The data was analyzed based on the objectives of the study. The analysis procedures include sorting of the questionnaires into various respondents' groups, coding the data by allocating a number to each questionnaire and response. The coded data were then inputted into an excel sheet because it is simple to use, edit, reference and correct the data, before exporting the data to SPSS version 20. The data processes comprise of, data cleaning and data analysis.

The data were cleaned, and then analyzed using descriptive and correlation. Preliminary diagnostic tests were carried out before regression analysis to ensure that there was no violation of the assumptions of normality, multicollinearity, and homoscedasticity. Normality assumptions confirm whether the residuals are normally distributed and multicollinearity ascertains whether the predictor variables are highly correlated, while homoscedasticity examines the difference in residual variance. Hence the study ensured that all the assumptions were strictly adhered to avoid getting errors in the final result. The study chose this analysis because, Spencer (2015) and Joshi, Kale, Chandel, and Pal, (2015) both state that parametric analysis can be performed on a likert scale items as much as the data conform to the parametric assumption.

Descriptive statistics data were grouped and summarized in terms of tables, percentages, means and standard deviation. Pearson correlation coefficients analysis was used to determine the level of association of CAD-CAM training, staff CAD-CAM competency, work experience, availability of CAD-CAM, leadership style and financial status with CAD-CAM usage. The correlation (r) was derived to indicate the nature and the strength of the association among the study variables. Multiple linear regressions were used to test the level of significance between the independent and dependent variable in the study.

The coefficient of determination (r^2) was used to measure the amount of variation in the dependent variable (CAD-CAM usage) accounted for by the independent variables. The F-ratio generated in the ANOVA table was used to measure the best fit line. P-value generated was to show how statistically significant an equation is at an alpha level of 0.05. The six study hypotheses were tested using *t*-test statistics out of the regression analysis. Different decisions were reached for each hypothesis based on the p-values obtained as they tend towards or further away from 5% level of significance.

3.11.2 Data Presentation

The data were presented using tables, percentages, means and standard deviation for descriptive statistics. Inferential statistics were presented in tables with appropriate explanation.

Table 3.1. Summary of Analytical Framework

S/N	Study Objectives	Methods of Analysis
1.	CAD-CAM Training	-Descriptive, -Pearson r Correlation, -Multiple Linear Regression
2.	CAD-CAM Competency	-Descriptive, -Pearson r Correlation, -Multiple Linear Regression
3.	Work Experience	-Descriptive, -Pearson r Correlation, -Multiple Linear Regression
4.	Availability CAD-CAM Program	-Descriptive, -Pearson r Correlation, -Multiple Linear Regression
5.	Leadership Style	-Descriptive, -Pearson r Correlation, -Multiple Linear Regression
6.	Financial Status	-Descriptive, -Pearson r Correlation, -Multiple Linear Regression

Source: Researcher's Survey (2017)

The analytical framework in table 3.4 comprises of descriptive statistics, Pearson coefficient correlation, and linear regression. The five study hypotheses were tested using regression *t*-test statistics.

3.11.3 Empirical Model

A multi-linear regression model was used to guide and establish the model through a combined effect of all variables. This consisted of the, CAD-CAM training, CAD-CAM competency, work experience, availability of CAD-CAM program and leadership style financial status and CAD-CAM usage. The multiple regression analysis entailed the regression of the independent, moderating, mediating variables on the dependent variable. The resultant model outcome formed;

$Y=\beta_0 + \beta_1 CCT + \beta_2 CTS + \beta_3 WE + \beta_4 ACCP + \beta_5 OLS + \beta_1 OFS + \varepsilon$

Where;

Y= composite index of the dependent variable used for CAD-CAM usage in textiles industries of Northern Nigeria.

β_0 = Constant (the intercept of the model)

$\beta_{1,}$ $\beta_{2,}$ $\beta_{3,}$ $\beta_{4,}$ $\beta_{5,}$ β_{6} = coefficients of the six study variables; CAD-CAM training, Competency of Textile Staff, Work Experience, Availability of CAD-CAM Program, Organizational Leadership Style and Organizational Financial Status

And,

CCT=CAD-CAM Training

CTS= Competency of Textile Staff

WE= Work Experience

ACCP= Availability of CAD-CAM Program

OLS= Organizational Leadership Style

OFS= Organizational Financial Status

e=random error term that accounts for variability in Y that cannot be explained by the linear effect of the predictor variables.

In order to ascertain the effect of the variables on the dependent variable, a simple stepwise multiple regression analysis was performed. This is a method for fitting or developing a regression model by adding (forward selection) or removing variables (backward selection) based on the t-statistics of their estimated coefficients. The study adopted both the forward and backward selection method in determining the relationship between a set of variables and the dependent variable. The resultant six coefficients p-values were used to test for the significance level of the $\beta_{1,}$ $\beta_{2,}$ $\beta_{3,}$ $\beta_{4,}$ $\beta_{5,}$ and $\beta_{6.}$ Also, the p-values were used to test hypotheses $H_{01,}$ H_{02} H_{03} H_{04} H_{05} and H_{06} of the study. Table 3.5 shows the criteria for hypotheses testing.

Table 3.5. Hypotheses Testing Criteria

Research objectives	Null hypothesis	Statistical model	Interpretation of the hypothesis	Criteria
To identify the level of CAD-CAM training received and CAD-CAM usage in textile industries of Northern Nigeria	HO_1. There is no significant relationship between CAD-CAM training received and CAD-CAM usage in textile industries of Northern Nigeria.	$Y=\beta_0+\beta_1CCT+e$ Where; Y=Composite index β_0=Intercept CCT= CAD-CAM Training e= random error	H_{O1}: $\beta 1=0$ Ha_1: $\beta_1 \neq 0$ Where; β_1=regression coefficient for CAD-CAM Training	p-values $\leq 0.05\%$
To examine the competencies of textile staff and CAD-CAM usage in textile industries of Northern Nigeria	HO_2. There is no significant relationship between staff competency and CAD-CAM usage in textile industries of Northern Nigeria	$Y=\beta_0+\beta_1CTS+e$ Where; Y=Composite index β_0=Intercept CTS= Competency of Textile Staff e= random error	H_{O1}: $\beta 1=0$ Ha_1: $\beta_1 \neq 0$ Where; β_1=regression coefficient for Competency of Textile Staff	p-values $\leq 0.05\%$
To determine the relationship between work experience and CAD-CAM usage in textile industries of Northern Nigeria	HO_3. There is no significant relationship between work experience and CAD-CAM usage in textile industries of Northern Nigeria	$Y=\beta_0+\beta_1WE+e$ Where; Y=Composite index β_0=Intercept WE=Work Experience e= random error	H_{O1}: $\beta 1=0$ Ha_1: $\beta_1 \neq 0$ Where; β_1=regression coefficient for Work Experience	p-values $\leq 0.05\%$
To establish the availability of CAD-CAM program and CAD-CAM usage in textile industries of Northern Nigeria	HO_4. There is no significant relationship between the availability of CAD-CAM program and CAD-CAM usage in textile industries of Northern Nigeria	$Y=\beta_0+\beta_1ACCP+e$ Where; Y=Composite index β_0=Intercept ACCP=Availability of CAD-CAM Program e= random error	H_{O1}: $\beta 1=0$ Ha_1: $\beta_1 \neq 0$ Where; β_1=regression coefficient for Availability of CAD-CAM Program	p-values $\leq 0.05\%$
To determine the organizational leadership influence on CAD-CAM usage in textile industries of Northern Nigeria	HO_5. Organizational leadership does not significantly influence on CAD-CAM usage in textile industries of Northern Nigeria	$Y=\beta_0+\beta_1OLS+e$ Where; Y=Composite index β_0=Intercept OLS=Organizational Leadership Style e= random error	H_{O1}: $\beta 1=0$ Ha_1: $\beta_1 \neq 0$ Where; β_1=regression coefficient for Organizational Leadership Style	p-values $\leq 0.05\%$
To ascertain the organizational financial influence on CAD-CAM usage in textile industries of Northern Nigeria	HO_6. There is no significant influence between organizational financial status and CAD-CAM usage in textile industries of Northern Nigeria	$Y=\beta_0+\beta_1OFS+e$ Where; Y=Composite index β_0=Intercept OFS=Organizational Financial Status e= random error	H_{O1}: $\beta 1=0$ Ha_1: $\beta_1 \neq 0$ Where; β_1=regression coefficient for Organizational Financial Status	p-values $\leq 0.05\%$

Table 3.5 hypotheses testing criteria. **Source**: Researcher's Survey (2017)

3.12 Logistical and Ethical Considerations

The researcher sought permission from Kenyatta University, Graduate School, before conducting the research (appendix B). Permission was sought from the Federal Ministry of Industries Trade and Investment, Abuja, Nigeria, instead of KU ethical review board because the area of the study was not in Kenya (appendix C).

The researcher also sought for permission from the selected textile industries as well as the respondents' consent (appendix A) before administering the questionnaire. The respondents were assured of total confidentiality and anonymity by not revealing their real identities and to also assure them that the information given would only be used for the purpose which is intended. Participation was purely voluntary and the respondents had the right to withdraw from the study at any time without giving any explanation to the researcher.

CHAPTER FOUR: FINDINGS

4.0 Introduction

This chapter presents the findings of the study with respect to the objectives of the study. The analysis of the study was done in accordance with the stated research objectives and hypotheses. The study findings are divided into four sections, which include; the response rate of the respondents, a descriptive analysis of all the objectives, Pearson r correlational analysis for the relationships and regression analysis for the inferential statistics.

4.1 Response Rate

The response rate is expressed as a calculated percentage of returned questionnaires. The study had three categories of respondents which are the designers, technologists, and the CEOs of the textile industries of Northern Nigeria.

Table 4. 1. Response Rate

Respondents	**Target no. of respondents**	**No. respondents Achieved**	**Percentage achieved**
Designers	58	55	**94.8%**
Technologist	86	83	**96.5%**
CEOs	8	8	**100%**
Total	**152**	**146**	**96.1%**

Out of the 152 questionnaires distributed, 146 were successfully completed, collated and used for the analysis which accounted for ninety-six points one percent (96.1%). According to Mugenda (2003), a response rate of seventy-five percent (75%) is adequate for analysis and reporting. Hence, a response rate of 96.1% for the current study is therefore considered an adequate rate to base the study conclusions.

4.2 Descriptive Analysis of Independent Variables

The researcher sought to find out how the independent variables best explain the level of CAD-CAM usage in the textiles industry of Northern Nigeria. Predicting variables such as CAD-CAM training, CAD-CAM competency, program, work experience, availability of CAD-CAM, the leadership style of the industries and the financial status of the industries were used.

4.2.1 Identifying the Level of CAD-CAM Training Received in Textile Industries of Northern Nigeria

The study sought to identify the level of CAD-CAM training and CAD-CAM usage in textile industries of Northern Nigerian.

Table 4. 2. Level of CAD-CAM Training Received

S/N	VARIABLES	SD	D	U	A	SA	Mean	SD
1	Received Training	15.1%	16.4%	22.6%	24.0%	21.9%	3.21	1.36
2	Formal Training	18.5%	16.4%	20.5%	24.0%	20.5%	3.12	1.40
3	Informal Training	16.4%	15.8%	21.9%	23.3%	22.6%	3.20	1.39
4	Collaboration	44.5%	27.4%	0.7%	18.5%	8.9%	2.20	1.40
5	Cert and Diploma	19.2%	16.4%	21.9%	23.3%	19.2%	3.07	1.39
6	Degree above	18.5%	15.8%	21.9%	23.3%	20.5%	3.12	1.40

Notes: SA = Strongly Agree, A = Agree, U = Undecided, D = Disagree, SD = Strongly Disagree, M = Mean, Sd. = Standard deviation

The results from table 4.2 indicate that 21% of the respondents strongly agreed that they have received training, 24.0% agreed that they received training. About 22.6% of the respondents were undecided on training received, whereas, 15.1% of the respondents strongly disagreed that they had received any form of training in the CAD-CAM technology and 16.4% said disagreed.

Responses on formal training revealed that 20.5% strongly agreed that they had received formal training in CAD-CAM technology, with 24.0% respondents indicated agreed. Twenty one point nine percent (21.9%) remained undecided while

18.5% of the respondents strongly disagreed that they had been formally trained in CAD-CAM technology where as 16.4% disagreed.

With regards to informal training in CAD-CAM training revealed that 23.3% strongly agreed that they had informal training, 21.9% disagreed that had any informal training. However, out of 146 respondents, only 20.5% were undecided, while16.4% strongly disagreed that they had not received any informal training and 15.8% said they disagreed. Nearly half of the respondents (44.5%) strongly disagreed that there was any training collaboration between textile industries and the institution of learning or CAD-CAM software developers, 27.4% disagreed on having any form of training collaboration. Zero point seven percent (0.7%) were undecided, whereas 8.9% strongly agreed that there was training collaboration between textile industries and the institution of learning or CAD-CAM software developers and 18.5% agreed that they was training collaboration.

Only 19.2% of the respondents strongly agreed that they had either a certificate, nearly a quarter (23.3%) who said they disagreed that they had a certificate or ordinary diploma in CAD-CAM technology, while 21.9% remained undecided. Furthermore, 19.2% said they strongly disagreed that they had either certificate or ordinary diploma in CAD-CAM technology, 16.4% of the respondents disagreed. Those who strongly agreed that they had either a Higher National Diploma (HND)/degree and above in the CAD-CAM technology were 20.5%, 23.3% agreed that they had either a Higher National Diploma (HND)/degree and above in the CAD-CAM technology, while 21.9% remained non-committed, and 18.5% strongly disagreed that they had possessed HND/degree and above, whereas 15.5% respondents disagreed they had HND/degree and above.

Summarily, Less than half (45.9%) of the respondents agreed that they have received different mode of training, while 31.5% disagreed that they had received any training and 22.6% were undecided. Formally trained were 44.9%, whereas 32.2% disagreed that they had formally training and 21.9% were undecided. Informal trained are 44.5%, 20.5% disagreed, and (34.9%) were undecided. Over two third (71.9%) of the respondents disagreed on having any training collaboration with any training body. Out of those who received training, 42.5% had either certificate or ordinary diploma in CAD-CAM technology, 35.6% disagreed that they had either certificate or ordinary diploma in CAD-CAM technology while 21.9% remain undecided. Those with Higher National Diploma were 43.8%, but 34.3% did not possess either HND/degree and above, while 21.9% were undecided.

4.2.2 Examining Staff Competency in Textile Industries of Northern Nigeria

The study sought to examine the competency level of the textile staff in different software packages and CAD-CAM usage in the textile industries of Northern Nigeria.

Table 4. 3. Staff Competencies in Textile Industries of Northern Nigeria

S/N	Software	NVC	NC	AC	C	VC	Mean	SD
1.	Corel draw	13.0%	13.7%	21.9%	26.7%	24.7%	3.36	1.34
2.	Adobe Photoshop	13.7%	16.4%	21.2%	24.7%	24.0%	3.29	1.36
3.	Adobe illustrator	13.7%	16.4%	21.9%	26.0%	21.9%	3.26	1.34
4.	Lectra	20.5%	17.8%	21.2%	21.9%	18.5%	3.00	1.40
5.	other packages	20.5%	20.5%	21.2%	19.2%	18.5%	2.95	1.40
6.	AVA	21.9%	20.5%	21.9%	18.5%	17.1%	2.88	1.40
7.	Textile Vision	54.8%	14.4%	15.1%	8.2%	7.5%	1.99	1.31
8.	Pro-Design	76.0%	13.7%	6.8%	1.4%	2.1%	1.40	0.84
9.	Pro-Weave	75.3%	13.0%	8.9%	1.4%	1.4%	1.40	0.82
10	Prima Vision	76.0%	14.4%	8.9%	0.7%	0.0%	1.34	0.67

Notes: NVC = Not Very Competent, NC = Not Competent, AC = Averagely Competent, C = Competent, VC = Very Competent, M = Mean, Sd. = Standard deviation

The findings in table 4.3 revealed that nearly a quarter (24.7%) of the respondents indicated that they were very competent in Corel draw software; over a quarter (26.7%) indicated that they were competent in Corel draw software while 21% said they were averagely competent. While only 13.7% indicated that they were not competent in Corel draw with 13.0% indicating that were very incompetent. In Adobe Photoshop, 24.0% said they were very competent in it, and nearly a quarter (24.7%) of the respondents indicated that they were competent in Adobe Photoshop.

While 21.2% showed that they were averagely competent, 16.4% indicated that they were not competent in Adobe Photoshop and 13.7% revealed that they were very incompetent. Similarly, 21.9% of the respondents indicated that they were very competent in adobe illustrator software; nearly above a quarter (26.0%) of the respondents said they were competent. Only 21.9% were averagely competent, 13.7% indicated that they were very incompetent in the adobe illustrator package and 16.4% said they were incompetent.

Result in table 4.3 revealed that 18.5% were very competent in Lectra, 12.9% indicated that they were competent. However, only 21.2% responded that they have average competency, while 20.5% said they were very incompetent and 17.8% said they were not competent. The findings on other software packages revealed that only 18.5% indicated that they were very competent, 19.2% said that they were competent. While 21.2% said they were averagely competent, 20.5% revealed that they were very incompetent in other software, whereas 20.5% were incompetent.

In AVA software, 17.1% of the respondents said they were very competent, 18.5% indicated that they were competent, whereas 21.9% indicated that they were averagely competent. But 21.9% said they were very incompetent, and 20.5% said they lacked competency in the AVA software. The findings further showed that only 7.5% were very competent in Textile Vision software, whereas 8.2% of the respondents were competent, 15.1% said they were averagely competent, while 54.8% indicated that they were very incompetent and 14.4% said they were not competent in the software.

Majority (76.0%) of respondents were very incompetent in Pro-Design software, while 13.7% of the respondents were incompetent, but 6.8% indicated that they were averagely competent. Similarly, whereas 2.1% said that they were very competent, 1.4%, indicated that they were competent in Pro-Design software. Most of the respondents (75.3%) were not competent in pro-weave software, 13.0% indicated that they were incompetent. While 8.9% respondents were averagely competent, 1.4% said they were very competent and 1.4% indicated that they were competent.

In prima vision, 76.0% of the respondents were very incompetent, 14.4% indicated that they were incompetent. But 8.9% of the respondents indicated that they were averagely competent, while 0.7% said they were competent. The main observation from the table indicates an average of 53.28% of the staff agreed that they are not competent in using most of the listed CAD-CAM program, but less than half (46.72%) of them indicated that they are competent. But some of the old software such as Corel draw, adobe Photoshop and adobe illustrator have the highest responses among others.

4.2.3 Determining the Work Experience in Textile Industries of Northern Nigeria

The study sought to determine the relationship between work experience and CAD-CAM usage in textile industries of Northern Nigeria. The inclusion of this item was crucial because it would interpret if the respondent's years in service have any relationship with CAD-CAM usage.

Table 4. 4. Years of Working Experience in Textile Industries of Northern Nigeria

S/N	Items	1	2	3	4	5	Mean	SD
1	Working Experience	20.5%	20.5%	21.2%	19.2%	18.6%	2.95	1.40

Notes: 1 = 0-6, 2 = 7-13, 3 = 14-21, 4 = 22-28, 5= 29 and above, M = Mean, Sd. = Standard deviation

The results in table 4.4 show that 20.5% had work experience of 0-13 years, 21.2% had 14-21years, and 19.2% had 22-28 years, while 18.5% had worked for about 29 years and above. About two third (62%) of the workers had 0-21years, while the remaining one third (37.8%) of the workers had worked for 22-29 years and above. Summarily, the study found that most (41%) of the workers had 0-13 years of service, 40% 14-28, while very few (19%) had spent more than 29 years and above.

4.2.4 Establishing the Availability of CAD-CAM Program in Textile Industries of Northern Nigeria

The study sought to establish the availability of CAD-CAM program and CAD-CAM usage in textile industries of Northern Nigerian

Table 4. 5. Availability of CAD-CAM Program in Textile Industries of Northern Nigeria

S/n	Items	SD	D	U	A	SA	Mean	SD
1	Awareness of CADCAM	17.8%	15.8%	21.9%	23.3%	21.2%	3.14	1.40
2	Availability CADCAM Software	15.8%	17.1%	21.9%	24.0%	21.2%	3.18	1.37
3	Accessibility CADCAM Use	14.4%	16.4%	22.6%	24.0%	24.0%	3.24	1.36

Notes: SA = Strongly Agree, A = Agree, U = Undecided, D = Disagree, SD = Strongly Disagree, M = Mean, Sd. = Standard deviation.

Table 4.5 shows that 21.2% of the respondents strongly agreed that they were aware of the CAD-CAM programs, whereas 23.3% agreed that they were aware. In addition, 21.9% of the respondents gave neutral responses, implying that, they were not sure or not aware of the CAD-CAM technology in the textile industry. But 17.8% of the respondents strongly disagreed that they were aware of the CAD-CAM technology in the textile industry whereas 15.8% disagreed. In CAD-CAM availability, 21.2% of the respondents strongly agreed that the CAD-CAM programs are available in the textile industry, whereas 23.3% agreed that they have the programs.

About 21.9% of the responses show that either there was no such program or they were not sure of its existence. However, 15.8% of the respondents strongly disagreed that the CAD-CAM program was available in the textile industries and 17.1% disagreed about the availability of the program. Nearly a quarter (24.0%) of the respondents affirmed that the CAD-CAM programs are accessible for in use in the textile industries, 24.0% also agreed that they can access the CAD-CAM program. while 22.6% were neutral about the accessibility of the CAD-CAM program. While 14.4% of the respondents strongly disagreed that the CAD-CAM program was in use in the textile industry, 16.4% disagreed about the accessibility of the program.

The main finding in table 4.5 shows that less than half (44.5%) of the respondents agreed that they were aware of the technology in textile industries, 33.6% disagreed, while 21.9% were not sure of the CAD-CAM programs. Nearly half (45.2%) of the respondents agreed that CAD-CAM programs are available, 32.9% of the respondents disagreed, whereas 21.9% said they were not sure. Less than (48%) of the respondents agreed that they have access to CAD-CAM programs, 30.8% disagreed and 22.6% were not sure.

4.3 Determining the Organizational Leadership Influence on CAD-CAM Usage in Textile Industries of Northern Nigeria

The study sought to determine whether the organizational leadership has any effect on CAD-CAM usage in textile industries of Northern Nigerian.

Table 4. 6. Leadership Style in Textile Industries of Northern Nigeria

S/N	Items	SD	D	U	A	SA	Mean	SD
1	Innovative in CADCAM	26.7%	10.3%	17.8%	45.5%	0.0%	2.82	1.27
2	CADCAM Flexible	44.5%	27.4%	0.7%	18.5%	8.9%	2.20	1.40
3	Support CADCAM Use	28.1%	44.5%	17.8%	0.7%	8.9%	2.18	1.12
4	Support CADCAM Training	28.1%	44.5%	16.8%	1.7%	8.9%	2.18	1.13
5	Employ CADCAM Expert	27.4%	60.0%	8.9%	0.0%	0.7%	1.84	0.63

Notes: SA = Strongly Agree, A = Agree, U = Undecided, D = Disagree, SD = Strongly Disagree, M = Mean, Sd. = Standard deviation

Table 4.6 results revealed that nearly a half (45.5%) of respondents agreed that leadership was CAD-CAM innovative. but 17.8% of the respondents were undecided, while 26.7% strongly disagreed and 10.3% disagreed that leadership was CAD-CAM innovative. Similarly, the results showed that 44.5% of the respondents disagreed that the leadership in the industries was CAD-CAM flexible, whereas 27.4% disagreed that leadership is CAD-CAM flexible. However, 0.7% was undecided, implying that they were unsure of the leadership position on being CAD-CAM flexibility, while 8.9% strongly agreed that leadership is CAD-CAM flexible, whereas 18.5% disagreed that leadership was CAD-CAM flexible.

Over a quarter (28.1%) of the respondents strongly disagreed that leadership is supportive of the use of CAD-CAM, while nearly a quarter of the responses disagreed that leadership is supportive of the use of CAD-CAM. Some of the respondents (17.8%) were undecided, meaning that they were not sure. However, 8.9% strongly agreed that the leadership supports the use of CAD-CAM and 0.7% also agreed. Over a quarter (28.1%) of the respondents strongly disagreed that the industries' leadership supports CAD-CAM training, close to a half of the respondents disagreed that leadership supports CAD-CAM training.

Similarly, the results revealed that 16.8% were undecided, while 8.9% strongly agreed that the leadership supports CAD-CAM training and 1.7% agreed with the assertion. On CAD-CAM expert employment by the industries leadership, nearly above a quarter (27.4%) of the respondents in strongly disagreed that textile industries' leadership employ CAD-CAM experts and more than half (60.0%) of the respondents disagreed leadership employs CAD-CAM experts. However, 8.9% were undecided, while point seven percent (0.7%) strongly agreed that leadership employs CAD-CAM experts.

The main finding from table 4.6 revealed that more than two third (72.6%) disagreed that leadership is supportive of the use of CAD-CAM, only 9.6% agreed whereas

17.8% were undecided. Most (71.9%) of the respondents disagreed that the leadership in the industries is CAD-CAM flexible in their opinion, while 27.4% agreed and 0.7% was undecided. Less than half (45.5%) of respondents indicated that leadership is CAD-CAM innovative, while 37.0% disagreed and 17.8% of the respondents were undecided. Majority of the respondents (72.6%) disagreed that the industries leadership supports CAD-CAM while only 9.6% agreed, whereas 17.8% were undecided. Most (87.4%) of the respondent disagreed that textile industries leadership employs CAD-CAM experts and only 0.7% agreed, whereas 8.9% were undecided.

4.4 Ascertain the Financial Influence on CAD-CAM Usage in Textile Industries of Northern Nigeria

The study further sought to ascertain whether the organizational financial status has any moderating effect on the relationship between the Predicting variables (availability of CAD-CAM program, work experience, CAD-CAM training, CAD-CAM competency) and the outcome variable (CAD-CAM usage) in textile industries of Northern Nigeria. Table 4.7 represents the responses generated from the likert scale questions that revealed the effect of the moderating variable (organizational financial status).

Table 4. 7. Financial Status Usage in Textile Industries of Northern Nigeria

S/N	Items	SD	D	U	A	SA	Mean	SD
1	High Sales	26.7%	10.3%	17.8%	45.2%	0.0%	2.82	1.27
2	Quality Goods	45.5%	27.4%	0.7%	18.5%	8.9%	2.20	1.40
3	Investment	44.5%	27.4%	1.7%	17.5%	8.9%	2.20	1.40
4	Mass Production	28.1%	44.5%	17.8%	0.7%	8.9%	2.18	1.13
5	Exporting	28.0%	45.6%	17.8%	0.9%	8.8%	2.18	1.12
65	Sufficient Fund	27.4%	63.0%	8.9%	0.0%	0.7%	1.84	0.63

Notes: SA = Strongly Agree, A = Agree, U = Undecided, D = Disagree, SD = Strongly Disagree, M = Mean, Sd. = Standard deviation

Nearly half (45.2%) of the respondents agreed that the industries usually have a high sale, but 17.8% said they were not sure of the sale. Over a quarter (26.7%) of the responses strongly disagreed that industries usually have a high sale, whereass 10.3% disagreed that textile industries have a high sale. Less than half (45.5%) of the responses strongly disagreed that the industries have the ability to produce quality textile materials, while over a quarter of the responses disagreed that the materials produced by the industries are qualitative.

However, 0.7% was not sure or undecided meaning they are not sure, whereas 8.9% strongly agreed that the industries produce quality textile materials. Similarly, 18.5% agreed that the materials produced by the industries are of good quality. On industries financial investment in CAD-CAM, nearly a half (44.5%) of the respondents strongly disagreed that the industries have sufficient funds to purchase the CAD-CAM technology, while 27.4% disagreed that the textile industries have the fund to purchase the technology.

On the contrary, 1.7% said they were not sure of the industries financial investment in CAD-CAM. While 8.9% strongly agreed that the industries have financial investment in CAD-CAM, 17.5% agreed that the industries are investing CAD-CAM technology. Above a quarter (28.1%) of the respondents strongly disagreed that the industries have the capacity for mass production of the textile materials, whereas, nearly half of the respondents disagreed that the industries are mass producing. On the contrary 17.8% were undecided, while 8.9% strongly agreed as opposed to 0.7% of the respondents who agreed that the industries are for mass production.

The findings on the export capacity of the textile industries also showed that 28.0% of the respondents strongly disagreed that the industries were exporting textile materials, and nearly half (45.6%) of the respondents disagreed that the industries were exporting their fabrics. However, 17.8% were not sure of the industries' export capacity, while 8.8% strongly agreed that the textile industries were exporting their textile materials, whereas 0.9% agreed on the industries' exports.

Nearly half (44.5%) of the respondents strongly disagreed that the industries have sufficient funds to purchase the CAD-CAM technology while above half (63.0%) of responses disagreed that the industries have sufficient funds. But 8.9% were not sure whether the industries have sufficient funds. 0.7% strongly agreed that textile industries have sufficient funds to purchase the needed CAD-CAM technology.

Summarily, most of the respondents (72.6%) disagreed that the industries are mass producing textile materials, 9.6% agreed, while 17.8% were undecided. Similarly, 72.9% disagreed that the industries produce quality textile materials, 27.4% agreed and 0.7% was undecided. Less than half (45.2%) of the respondents agreed that the textile industries have high sales, 37.0% disagreed, whereas 17.8% were undecided.

Most (73.6%) of the respondents disagreed that the industries were exporting textile materials, 9.7% agreed and 17.8% were undecided. Majority (90.4%) of the respondents disagreed that the industries have sufficient funds to purchase the CAD-CAM technology, 0.7% agreed, and 8.9% were undecided. Majority (71.9%) of the respondents disagreed that the industries are investing in CAD-CAM technology, 27.4% agreed 0.7% were undecided.

4.5 Descriptive Analysis of Dependent Variables

The study also sought to find out the frequency and efficiency of CAD-CAM usage by the textile industries under study. The respondents were asked to tick responses based on a 5 point likert scale indicating the extent to which they agreed or disagreed that the textile industries are frequently using the CAD-CAM technology and how efficient is it. The results obtained were summarized in table 4.8 and 4.9.

Table 4. 8. Dependent Variable (Efficiency of CAD-CAM Use)

S/N	Items	**SD**	**D**	**U**	**A**	**SA**	**Mean**	**SD**
1	Efficiency of Use	18.5%	15.8%	21.9%	22.6%	21.2%	3.12	1.40

Notes: SA = Strongly Agree, A = Agree, U = Undecided, D = Disagree, SD = Strongly Disagree, M = Mean, Sd. = Standard deviation

Table 4.8 shows that, 21.2% strongly agreed that the textile industries were efficiently using CAD-CAM technology in the production of their textile materials, and 22.6% of the responses agreed that the industries were efficiently using the CAD-CAM technology. But 21.9% of the respondents were not sure of the efficient use of CAD-CAM technology in the industries. While, 18.5% strongly disagreed that the industries were efficiently using the CAD-CAM technology, 15.8% also disagreed on the efficiency of the use.

From the main findings of table 4.8, less than half (43.8%) of the respondents agreed that the textile industries were efficiently using CAD-CAM technology in the production of their textile materials, 34.3% disagreed, where as 21.9% of the respondents were not sure.

Table 4. 9. Dependent Variable (Frequency of CAD-CAM Use)

S/N	Items	**SD**	**D**	**U**	**A**	**SA**	**Mean**	**SD**
1	Frequency of Use	17.8%	15.8%	21.9%	23.3%	21.2%	3.14	1.40

Notes: SA = Strongly Agree, A = Agree, U = Undecided, D = Disagree, SD = Strongly Disagree, M = Mean, Sd. = Standard deviation

From table 4.9, 21.2% of the respondents strongly agreed that the industries are frequently using CAD-CAM technology in the production of textile materials, nearly a quarter (23.2) of the responses also agreed that the industries were frequently using the technology. However, 21.9% were not sure of how frequent the industries are using the technology, while 17% strongly disagreed that the industries are frequently using CAD-CAM technology and 15.5% agreed on the frequent use of the technology.

Table 4.9 can be summarized as 44.5% of the respondents agreed that the industries are frequently using CAD-CAM technology in the production of textile materials. 32.5% disagreed and 21.9% were not sure.

4.6 Pearson Correlation Analysis

Pearson Correlation analysis was conducted in order to test the association that exists between the CAD-CAM training, CAD-CAM competency, work experience, availability of CAD-CAM program, leadership style and financial status they relate to CAD-CAM usage in textile industries of Northern Nigeria. A Pearson correlation coefficient of magnitude of less than or equal to 0.20 is regarded as very weak: > 0.20 and less than or equal to 0.40 is weak; > 0.40 and less than or equal to 0.60 is moderate: >0.60 and less than or equal to 0.80 is strong; > 0.80 has a very strong magnitude indicating higher degree of association between two variables.

The study used an F-test statistics to determine whether a relationship that exists among variables could be generalized to the population that was represented in the study sample. The *t*-test was used in statistics to evaluate the individual relationship between each independent variable and as they relate to the dependent variable.

4.6.1 CAD-CAM Training and CAD-CAM Usage

The study sought to find out how CAD-CAM Training (received training, formal and informal, different certification level) relates to CAD-CAM usage.

Table 4. 10. Relationship between CAD-CAM Training and CAD-CAM usage

S/N	Variables	r	p-value
1.	Received Training	.896**	0.00
2.	Formal Training	.964**	0.00
3.	Informal Training	.883**	0.00
	Collaboration	-0.45	0.59
4.	Training Cert and Diploma	.853**	0.00
5.	Training Degree above	.968**	0.00

**. Correlation is significant at the 0.01 level (2-tailed). *. Correlation is significant at the 0.05 level (2-tailed).

Table 4.10 indicates that the result of Pearson Correlation of CAD-CAM training and CAD-CAM usage show that CAD-CAM training was positively and strongly associated with CAD-CAM usage ($r=0.896$, $p<0.00$). The Pearson table also reveals that there was a positive and strong association between formal training in CAD-CAM and CAD-CAM usage ($r=0.964$, $p<0.00$), and informal training in CAD-CAM was positively and strongly associated with CAD-CAM usage ($r=0.883$, $p<0.00$). The Pearson result for collaboration between industries and learning institution indicated a negative and moderate association with CAD-CAM usage ($r=-0.45$, $p>0.59$). The responses of those who have a Certificate or Diploma was positively and strongly associated with CAD-CAM usage ($r=0.853$, $p<0.00$). Likewise, for those who have a degree and above, the response was positively and strongly associated with CAD-CAM usage ($r=0.968$, $p< 0.00$).

4.6.2 CAD-CAM Competency and CAD-CAM Usage

The study sought to find out how various constructs under staff competency (independent variable) in different software associate with CAD-CAM usage.

Table 4.11. Relationship between CAD-CAM Competency and CAD-CAM Usage

S/N	Variables	r	p-value
1.	Competence Lectra	.883**	0.05
2.	Competence Textile Vision	.388**	0.03
3.	Competence AVA	.793**	0.20
4.	Competence ProDesign	.048	0.56
5.	Competence ProWeave	.025	0.77
6.	Competence Corel draw	.841**	0.00
7.	Competence PrimaVision	.069	0.41
8.	Competence Adobe illustrator	.744**	0.10
9.	Competence Adobe Photoshop	.804**	0.02
10.	Competence others software Package	.859**	0.20

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

The Pearson correlation in table 4.11 on CAD-CAM competency revealed a positive and strong association between CAD-CAM competence in lectra software and CAD-CAM usage ($r=0.883$, $p< 0.05$). Similarly, the staff competency in textile vision software also showed a medium and positive association with CAD-CAM usage ($r=0.388$, $p< 0.03$). The result further shows that there was a positive and strong association between staff Competence in AVA software and CAD-CAM usage, but not significant ($r=0.793$, $p< 0.20$). Competency in Pro-Design software revealed a positive and weak association with CAD-CAM usage but not significant ($r=0.048$, $p>0.56$). Competency in Pro-weave also indicates a positive and weak association with CAD-CAM usage but not significant ($r=0.025$, $p>0.77$).

Competency in Corel draw software shows a positive and strong association with CAD-CAM usage ($r=0.841$, $p<0.00$). The Pearson correlation result of staff Competency in Prima Vision software reveals that there was a positive and strong association with CAD-CAM usage, but not significant ($r=0.069$, $p< 0.41$). Pearson correlation between staff competency in Adobe Illustrator software also shows a positive and strong association with CAD-CAM usage but not significant ($r=0.744$, $p< 0.10$).

There was a positive and strong association between staff competency in Adobe Photoshop software and CAD-CAM usage ($r=0.804$, $p< 0.02$). The competency of textile staff in another software package besides the ones listed and CAD-CAM usage shows a positive and strong association between staff competency and CAD-CAM usage, but not significant ($r=.859$, $P=0.20$).

4.6.3 Work Experience and CAD-CAM Usage

The study sought to find out whether the number of years a staff spent in the industry has any association with his or her ability to use the CAD-CAM technology effectively. The results from the findings are displayed in table 4.12.

Table 4. 12. Relationship between Work Experience and CAD-CAM Usage

S/N	Variables	r	p-value
1.	Working Experience	.859**	0.00

**. Correlation is significant at the 0.01 level (2-tailed). *. Correlation is significant at the 0.05 level (2-tailed).

The Pearson correlation in table 4.12 reveals that there was a positive and strong association between work experience and CAD-CAM usage ($r=0.859$, $p<0.00$).

4.6.4 CAD-CAM Program Availability and CAD-CAM Usage

The study sought to find out how various constructs in the independent variable (availability of the CAD-CAM program) such as the awareness of staff on CAD-CAM technology, availability of the CAD-CAM software in the industry and accessibility of CAD-CAM to use on dependent variables (CAD-CAM usage).

Table 4. 13. Relationship between Availability of CAD-CAM Program and Usage

S/N	Variables	r	p value
1.	Availability Awareness Of CADCAM	.996**	0.00
2.	Availability CADCAM Software	.219**	0.01
3.	Accessibility of CAD-CAM to Use	.926**	0.02

**. Correlation is significant at the 0.01 level (2-tailed). *. Correlation is significant at the 0.05 level (2-tailed).

The Pearson Correlation results in table 4.13 indicates that availability of CAD-CAM software was positively and strongly associated with CAD-CAM usage (r=0.996, p< 0.00). Similarly, availability of CAD-CAM Software was also positively and weakly associated with CAD-CAM usage (r=0.219, p < 0.01). There was a positive and strong association between accessibility of CAD-CAM and CAD-CAM usage (r=0.926, p< 0.02).

4.6.5 Mediating Variable Leadership Style of the Industries

The study sought to investigate whether there is an association between the mediating variable and the dependent variable. The finding is important because it will tell whether there are any association, strength and the direction of the leadership style (mediating) on CAD-CAM usage.

Table 4. 14. Organizational Leadership Influence on CAD-CAM Usage

S/N	Variables	r	p-value
1.	Leadership Support the Use of CAD-CAM	-.046	0.58
2.	Leadership CAD-CAM Flexible	-.045	0.59
3.	Leadership is Technologically Innovative in CADCAM	-.041	0.63
4.	Leadership Support CAD-CAM Training	-.046	0.58
5.	Leadership Employ CAD-CAM Expert	-.131	0.11

**. Correlation is significant at the 0.01 level (2-tailed). *. Correlation is significant at the 0.05 level (2-tailed).

Table 4.14 indicates the strength and directions of association between all the leadership constructs and CAD-CAM usage. Constructs such as leadership support to the use of CAD-CAM was negatively and moderately associated with CAD-CAM usage but not significant (r=-.046, p>0.58). Similarly, Leadership flexibility in CAD-CAM was negatively and moderately associated with CAD-CAM usage but not significant (r=-.045, p>0.59). Leadership innovation in CAD-CAM technology was negatively and strongly associated with CAD-CAM usage but not significant (r=-.041, p>0.63). Leadership support for CAD-CAM training was negatively and moderately associated with CAD-CAM usage but not significant (r=-.046, p>0.58).

Employment of CAD-CAM expert was positively and weakly associated with CAD-CAM usage but it's not significant but not significant (r=-.131, p< 0.11). This implies that leadership style was independent of CAD-CAM usage in textile industries of Northern Nigeria.

4.6.6 Moderating Variable Financial Status of the Industries

The study sought to determine if there is an association between the moderating variable (financial status) and CAD-CAM usage in textile industries of Northern Nigeria.

Table 4. 15. Financial Influence on CAD-CAM Usage

S/N	Variables	r	p-value
1.	Mass Production	-.046	0.58
2.	Quality Goods	-.045	0.57
3.	High Sales	-.041	0.63
4.	Exporting	-.046	0.57
5.	Sufficient Fund	-.131	0.12
6.	Finance Investment	-.045	0.59

**. Correlation is significant at the 0.01 level (2-tailed). *. Correlation is significant at the 0.05 level (2-tailed).

Table 4.15 indicates that mass production was negatively and moderately associated with CAD-CAM usage, but not significant (r=-.046, p>0.58). Similarly, the quality of goods was negatively and weakly associated with CAD-CAM usage but not significant (r=-.045, p>0.57). High sales was negatively and strongly associated with CAD-CAM usage but not significant (r=-.041, p>0.63). Exporting was negatively and moderately associated with CAD-CAM usage but not significant (r=-.046, p>0.57). Sufficient Funds also negatively and weakly associated with CAD-CAM usage but not significant (r=-.131, p<0.11). Finance Investment indicates was negatively and moderately associated with CAD-CAM usage but not significant (r=-.045, p>0.59).

Table 4. 16. Overall Pearson Correlation matrix of the study variables

S/N	Variables	R	p-value
1.	CAD-CAM Training	.973**	0.01
2.	CAD-CAM Competence	.908**	0.03
3.	CAD-CAM Work Experience	.859**	0.02
4.	Availability CAD-CAM Program	.897**	0.00
5.	Leadership Style	-.066	0.43
6.	Finance Status	-.063	0.45

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

Table 4.16 indicates the overall result of the variables and how each variable correlates with CAD-CAM usage. The findings indicate that there was a positive and strong association between CAD-CAM training and with CAD-CAM usage. The result showed that staff competency is positively associated with CAD-CAM usage (r=0.973, p< 0.01). A positive and strong association also existed between staff competency and CAD-CAM usage (r=0.908, p<0.03). Work experience was positively and strongly associated with CAD-CAM usage (r=0.859, p< 0.02). Additionally, the availability of CAD-CAM is positively and strongly associated with CAD-CAM usage (r=0.897, p< 0.00).

However, the leadership style of the textile industries which served as a moderating variable showed a negative association with CAD-CAM usage, but not significant (r-0.066, p<0.43). Similarly, the financial status of the industries also indicates a negative association with CAD-CAM usage, but not significant (r=-0.063, p<0.45).

4.7 Diagnostic Test

The study conducted a preliminary check on the basic assumptions of linear regression analysis such as linearity, normality, multicollinearity, and homoscedasticity to ensure that they are not violated. Table 4.17 displays the result of the normality test.

Table 4. 17. Normality Tests

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	Df	Sig.
Training	.183	146	.01	.911	146	.00
Competence	.095	146	.03	.958	146	.04
Work Experience	.161	146	.00	.891	146	.01
Availability CAD-CAM	.097	146	.02	.960	146	.03
Leadership Style	.275	146	.00	.770	146	.03
Finance Status	.322	146	.02	.786	146	.01
CAD-CAM Usage	.171	146	.00	.890	146	.02

Lilliefors Significance Correction

The normality test in table 4.17 presents that Kolmogorov-Smirnov test and Shapiro-Wilk test conducted on CAD-CAM training, CAD-CAM competency, work experience, availability of CAD-CAM program, leadership style and financial status and CAD-CAM usage. The result shows that all the samples were significantly non-normal (000, p<.05) at a standard deviation of (146) and apha 0.05. Consequently, the distributions of the samples were significantly different from the normal distribution. It also means that the distribution was not normal and the test confirmed that the deviation was all significant.

Table 4. 18. Multicollinearity Test

	Collinearity Statistics	
	Tolerance	VIF
CAD-CAM Training	0.11	9.32
CAD-CAM Competence	0.16	6.15
Work Experience	0.29	3.40
Availability CAD-CAM Program	0.19	5.40
Leadership Style	0.19	5.36
Finance Status	0.19	5.37

The result in table 4.18 shows a variance inflation factors (VIF) values of 5.401 for the CAD-CAM training (9.316), CAD-CAM competence (6.153), work experience (3.396), availability CAD-CAM program (5.40), leadership style (5.358) and finance status (5.369). The results indicate that the values of the VIF obtained from all the variables were within an acceptable range of 1-10. Since VIF values were not less than one or greater than ten, it means that there were no multicollinearity symptoms. This implies that the correlation between predicting variables cannot inflate the variance of the coefficient estimates by causing the coefficients to switch signs, or makes it more difficult to interpret the model.

4.8 Homoscedasticity Test

Homoscedasticity is an assumption test in a linear regression model which show whether the error term is the same across all values of the independent variables within the residual variance values. The study homoscedasticity test result is displayed in (Appendix F).

4.9 Multiple Linear Regression Analysis

The Multiple linear regression estimates the coefficients of the linear equation. This involves the use of one or more independent variables that best predict the value of the dependent variable. In the regression analysis, the level significance, probability (p) value was determined for the relationship between the independent variable and the dependent variable. The regression analysis performed was to test the level of significance and to determine the relationship that exists between the independent variables and the dependent variable.

4.9.1 Regression Model

The regression model in table 4.19 indicates the various values of the coefficient of determination where R^2 (.959) 95.9% and adjusted R^2 (.958) 95.8%. This implies that the regression model is a significant predictor of CAD-CAM usage. From the regression results in table 4.19, the model of fitness revealed that the R-value was 0.979. This indicates that there was a positive relationship between the CAD-CAM training, CAD-CAM competencies, work experience and availability of CAD-CAM program. The coefficient of determination R^2 was 0.959.

Table 4. 19. Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.979[a]	.959	**.958**	.28598	1.396

a.Predictors: (Constant), CAD-CAM Competence, CAD-CAM Work Experience, CAD-CAM program, CAD-CAM Training
b. Dependent Variable: CAD-CAM Usage

Table 4.19 suggests that CAD-CAM training, and CAD-CAM competency, work experience and availability of CAD-CAM program explain 95.8% of variation in CAD-CAM usage by textile industries of Northern Nigeria. The remaining 4.2% can be explained using other determinants or factors. It can, therefore, be inferred that there was a strong relationship between the independent variables and the dependent variables.

Additionally, the Durbin-Watson result of 1.396 in table 4.19 shows that there was no presence of autocorrelation in the residuals result of the regression analysis. This implies that the values of the result also met the assumption that errors in the regression are independent of each other since the Durbin-Watson statistic value (1.396) is between the range of 1 and 2.

Table 4. 20. Analysis of Variance (ANOVA)

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	270.114	4	67.529	**825.704**	.000[b]
	Residual	11.531	141	.082		
	Total	281.646	145			

a. Dependent Variable: Usage
b. Predictors: (Constant), Competence, Work Experience, Availability, Training

The analysis of variance (ANOVA) in table 4.20 reveals that the F value of 825.704 is statistically significant at a p-value of 0.000 which is less than 0.05 at 5% level of significance. This shows that the CAD-CAM training and CAD-CAM competency, work experience, availability of CAD-CAM program on CAD-CAM usage in textile industries of Northern Nigeria was significant.

Table 4. 21. Regression Model

Model		**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**
		B	**Std. Error**	**Beta**		
1	(Constant)	-.371	.084		-4.396	.00
	CAD-CAM Training	.733	.056	.685	13.179	.02
	CAD-CAM Competence	.154	.072	.090	2.145	.03
	Work Experience	.141	.031	.142	4.524	.00
	Availability CAD-CAM	.126	.050	.099	2.508	.01

Results in table 4.21 indicates that there was a positive relationship between the CAD-CAM training, and CAD-CAM competency, work experience and availability of CAD-CAM program on CAD-CAM usage in textile industries of Northern Nigeria as supported by beta coefficients of 0.126, 0.141, 0.733 and 0.154 respectively.

This means that an increase in CAD-CAM training, and CAD-CAM competency, work experience, availability of CAD-CAM program will positively increase CAD-CAM usage in textile industries of Northern Nigeria. The analysis also show that the CAD-CAM training, and CAD-CAM competency, work experience and availability of CAD-CAM program was statistically significant as the probability (p) value was 0.00 which is not more than the conventional value of 0.05. The model indicates that CAD-CAM Training, and CAD-CAM Competence, work experience, availability of CAD-CAM program, were good predictors of CAD-CAM usage.

According to the regression equation established, taking all factors into account and the constant is at zero, the CAD-CAM usage in textile industries of Northern Nigeria is -.371.

Therefore,

$$CAD - CAM\ Usage = -0.371 + 0.126(Availability\ of\ CAD - CAM\ Program) + 0.141(Work\ Experience) + 0.733(CAD - CAM\ Training) + 0.154(CAD - CAM\ Competency)$$

4.9.2 Moderating Variables Financial Status

The researcher sought to find out whether the moderating variable (W) has any influence on the relationship that exists between the independent variables (X). Where X is the sum of independent variables (CAD-CAM training, and CAD-CAM competency, work experience and CAD-CAM program) and W is the moderating variable (financial status) and Y dependent variables (CAD-CAM usage) in the textiles industry of Northern Nigeria.

Table 4. 22 Model Summary

R	R^2	MSE	F(HC1)	df1	df2	P
.970	**.940**	.119	1430.373	3.000	142.000	.01

Table 4.22 revealed the model summary of the moderating variable which shows that R^2 is 0.940 (94%) which is strong and positive with a $p < 0.00 < 0.05$

Table 4.23 Coefficient of the Interaction between Independent Variables (X) and Moderating Variables (W)

	Coeff	se(HC1)	t-value	p-value	LLCI	ULCI
Constant	3.133	.029	107.974	.00	3.076	3.191
Sum of (X)	1.252	.020	62.480	.00	1.212	1.291
Fin stat (W)	**.021**	.030	.698	**.49**	-.039	.081
Int_1	**-.003**	.020	-.144	**.89**	-.043	.037

Table 4.23 revealed that the coefficient of interaction between independent variable X (CAD-CAM training, and CAD-CAM competency, work experience CAD-CAM

program) and moderating variable W (financial status) was not significant (p>.89 >0.05). This means that the financial status of the industries has no moderating effect on CAD-CAM Usage. Furthermore, financial status (p> **.**49 > 0.05) was not a significant predictor of the outcome variable (CAD-CAM Usage). Since the result in the table contained zero in between the lower level confidence intervals (LLCI) -.039 and the upper-level confidence interval (ULCI) .081. This implies that the financial status of the textile industries does not influence the use of CAD-CAM technology in the textile industries of Northern Nigeria.

4.9.3 Mediating Variables (Leadership style)

The study sought to find out whether there is any mediation among variables such as financial status that might impact the relationship between the independent variables and dependent variables (CAD-CAM usage) in the textiles industry of Northern Nigeria. This study intends to find out whether X (independent variable) predicts M (mediating variable), which in turn predicts Y (dependent variable). Where X is the sum of independent variables (, CAD-CAM training, and CAD-CAM competency, work experience, CAD-CAM program), and M is the moderating variable (leadership style) and Y dependent variables (CAD-CAM usage) in the textiles industry of Northern Nigeria.

Table 4.24 Model Summary

R	R^2	MSE	F(HC1)	df1	df2	p
.0603	**.004**	1.974	.567	1.000	144.000	**.45**

Outcome Variable: Leadership style

Table 4.24 indicates a summary of the model between X (independent variable) and M (mediating leadership style) where leadership style showed an R^2 value of .004 = 0.4% which is very low. This implies that leadership style does not adequately contribute to the use of CAD-CAM technology industries under study.

Table 4.25 Model of Coefficient of the Interaction between Independent variable (X) and Mediating leadership style (M)

	Coeff	se(HC1)	t-value	p-value	LLCI	ULCI
Constant	2.429	.333	7.292	.00	1.770	3.087
Sum of X	**-.078**	.104	-.753	**.45**	-.284	.127

Table 4.25 indicates that the independent variable X had a negative coefficient and there was no significant relationship (-.078, p>0.45> 0.05). And the confidence level of -0.284 and 0.127 thereby containing zero in between the upper level and the lower level of confidence.

Table 4.26 Model Summary

R	R^2	MSE	F(HC1)	df1	df2	p
.9696	**.940**	.118	2086.530	2.000	143.000	**.00**

Table 4.26 indicates a summary of the model between CAD-CAM usage, a summary of independent variable X and mediating leadership style M with an R^2 value of 0.940 (94%) and is significant (p>0.00< 0.05).

Table 4.27 Model

	Coeff	se(HC1)	t-value	p-value	LLCI	ULCI
Constant	-.574	.081	-7.06	.00	-.734	-.4131
Sum of X	1.251	.020	63.35	.00	1.212	1.2900
Lead styl	.013	.022	.60	**.55**	-.030	.056

Outcome Variable: CAD-CAM Usage

The result in Table 4.27 indicates the various coefficient of independent variable with leadership style and CAD-CAM usage (1.251, 0.013, and-0.574). This implies that although there was a significant relationship between the independent variable and CAD-CAM usage (-0.574), leadership style was not statistically significant (p=0.55 > 0.05).

4.9.4 Total Effect Model

The model in table 4.28 tests whether there is any effect of the mediator on the result of the dependent variable CAD-CAM usage.

Table 4.28 Model Summary

R	R-sq	MSE	F(HC1)	df1	df2	P
.971	**.940**	1173	4157.537	1.000	144.000	.00

The model summary reveals that a positive R^2 value of 0.940 (94%) was significant (p>0.00<0.05).

Table 4.29 Model

	Coeff	se(HC1)	t-value	p-value	LLCI	ULCI
Constant	-.5422	.0605	-8.96	.00	-.6618	-.4226
Sum of X	1.2500	.0194	64.48	**.00**	1.2117	1.2883

Table 4.29 shows the summary of coefficient of determination which is significant at (p0.00 > 0.05)

Total, Direct, and Indirect Effects of X on Y

Table 4.30 Total Effect of X on Y

Effect	se(HC1)	t-value	p-value	LLCI	ULCI	c_ps	c_cs
1.250	.019	64.48	**.00**	1.212	1.288	.897	.970

The total effect of X on Y as shown in table 4.30 has shown a p> .000 < 0.05, this means that the direct effect of X on Y was significant.

Table 4.31 Direct Effect of X on Y

Effect	se(HC1)	t-value	p-value	LLCI	ULCI	c_ps	c_cs
1.251	.020	63.35	**.00**	1.212	1.290	.898	.970

The direct effect of X on Y as indicated in table 4.31 has revealed a p>0.00 < 0.05, this implies that the direct effect of X on Y was significant. To check for the mediation effect, interest is put on the bootstrap confidence intervals. This was done by checking to see whether or not the bootstrap confidence intervals contain Zero (0) or not. If it does contain zero, then there was no mediation effect.

Table 4.32 Indirect Effect(s) of X on Y

	Effect	Boot SE	Boot LLC	Boot ULCI
Lead styl	-.001	.003	**-.009**	**.004**

Table 4.32 indicates the indirect effect(s) of X on Y. the result showed a Bootstrap Lower Level Confidence Interval (**-0.009**) and Bootstrap Upper-Level Confidence

Interval (0**.004).** Since the 95% confidence limits include zero, then the indirect effect test was not significant.

Table 4.33 Partially Standardized Indirect Effect(s) of X on Y

	Effect	Boot SE	Boot LLC	Boot ULCI
Lead styl	-.001	.002	**-.006**	**.003**

Similarly, since the 95% confidence interval in table 4.33 include zero, the indirect effect test was not significant

Table 4.34 Completely Standardized Indirect Effect(s) of X on Y

	Effect	Boot SE	Boot LLC	Boot ULCI
Lead styl	-.001	.002	**-.007**	**.003**

Since the 95% confidence interval include zero, the indirect effect test was not significant. The three tables, 3.32, 3.33 and 3.34, shows clearly that the Bootstrap confidence intervals contain Zero (0), indicating that Leadership style does not have a mediating effect on CAD-CAM Usage.

4.10 Hypotheses Test for CAD-CAM Training, Competency and Usage

Multiple linear regressions were performed to assess the relationships that exist between the study variables. All the six independent variables were put into the regression equation together while the composite dependent variable (CAD-CAM usage) was used to test the relationship between them and its level of significance. Multiple R-square measured the strength of the relationship between the set variables in the composite independent variables and the dependent variable. The data was first of all diagnosed to ensure that none of the multiple linear regression assumptions is violated.

Table 4. 35. Summary Test Hypotheses

S/N	Hypothesis by Objectives	Beta	T	p-value	Decision
1.	CAD-CAM Training and CAD-CAM Usage	0.686	13.117	0.01	**Reject Ho_3**
2.	CAD-CAM competency and CAD-CAM Usage	0.089	2.085	0.04	**Reject Ho_4**
3.	Work experience and CAD-CAM Usage	0.143	4.539	0.00	**Reject Ho_2**
4.	Availability of CAD-CAM and CAD-CAM Usage	0.099	2.497	0.01	**Reject Ho_1**
5.	leadership Style and CAD-CAM Usage	0.003	0.083	0.93	**Do not Reject Ho_5**
6.	Financial Status and CAD-CAM Usage	0.010	0.249	0.80	**Do not Reject Ho_6**

Table 4.35 is a summary of the entire tested hypotheses. The table reveals that four out of the six null hypotheses have been rejected while the other two were not rejected. The rejected hypotheses are CAD-CAM training, and CAD-CAM competency, work experience and Availability of CAD-CAM program. The null hypotheses not rejected were leadership style and financial status.

4.10.1 CAD-CAM Training and CAD-CAM Usage

The null hypothesis (Ho_1) states that there was no significant relationship between CAD-CAM Training and CAD-CAM usage in the textile industries of Northern Nigeria. Based on the findings in table 4.35, the t-statistics and the p-value of CAD-CAM Training indicated $t=13.117$, $p\leq 0.00$, and $p\leq 0.00 \leq 0.05$. This implied that there was a significant relationship between CAD-CAM Training and CAD-CAM usage in the textile industries of Northern Nigeria. Hence, the study rejected the null hypothesis.

4.10.2 CAD-CAM Competency and CAD-CAM Usage.

The null hypothesis (Ho_2) states that there was no significant relationship between CAD-CAM competency and CAD-CAM usage in the textile industries of Northern

Nigeria. And since the study findings in table 4.35 indicated that t-statistics and the p-value of CAD-CAM competency are; $t=2.085$, $p \leq 0.04$ showing a greater $p \leq 0.039 \leq 0.05$. The result implied that there was a significant relationship between the CAD-CAM competency and CAD-CAM usage in the textile industries of Northern Nigeria, hence, the null hypothesis was rejected.

4.10.3 Work Experience and CAD-CAM Usage.

The null hypothesis (Ho_3) was that there was no significant relationship between the work experience and CAD-CAM usage in the textile industries of Northern Nigeria. Table 4.35 result indicates that the t-statistics and the p-value of work experience are $t=4.539$, and $p \leq 0.00$, implying that $p \leq 0.000 \leq 0.05$. This result shows that there was a significant relationship between work experience and CAD-CAM usage in the textile industries of Northern Nigeria. Consequently, the study rejected the null hypothesis.

4.10.4 Availability of CAD-CAM Program and CAD-CAM Usage.

Based on the result in table 4.35, the null hypothesis (Ho_4) which states that there was no significant relationship between the availability of CAD-CAM program and CAD-CAM usage in textile industries of Northern Nigeria was rejected because the t-statistics and the p-value of availability of CAD-CAM program indicated $t=2.497$, and $p \leq 0.014$. Since $p \leq 0.014 \leq 0.05$, implying that there was a significant relationship between the availability of CAD-CAM program and CAD-CAM usage in textile industries of Northern Nigeria.

4.10.5 Organizational Leadership Influence on CAD-CAM Usage.

The study null hypothesis (Ho_5) states that Organizational leadership does not significantly influence CAD-CAM usage in the textile industries of Northern Nigeria.

The study findings indicated ($t=0.083$, $p \geq 0.93$) as the t-statistics and the p-value of Organizational leadership. And since the p-value is greater than 0.05 ($0.93 \geq 0.05$), then the study did not reject the null hypothesis. This implies that Organizational leadership does not significantly influence CAD-CAM usage in the textile industries of Northern Nigeria.

4.10.6 Organizational Financial Influence on CAD-CAM Usage.

The null hypothesis (Ho_6) states that there was no significant influence between organizational financial status and CAD-CAM usage in the textile industries of Northern Nigeria. From table 4.35 the t-statistics and the p-value of organizational financial status showed that $t=0.249$, $p \geq 0.80$. Since the *p*-value was greater than the alpha value ($0.80 \geq 0.05$) hence the study did not reject the null hypothesis. This suggests that there was no significant influence between organizational financial status and CAD-CAM usage in the textile industries of Northern Nigeria

4.11 Summary

This chapter has presented the findings of the study on computer-aided design and computer aided manufacturing training, competency, and usage in textile industries of Northern Nigeria. The findings of the study were presented in the following sequence; the study distributed 152 questionnaires, out of which 146 were successfully completed, collated and used for the analysis which gives a response rate of ninety-six point one percent (96.1%). The descriptive results of the study showed that there were more textile technologists than textile designers in the industries under study.

CAD-CAM training result indicated that less than half (45.9%) of the respondents agreed that they have received different mode of training, while very few (22.6%) were undecided, and less than one third (31.5%) of the respondents disagreed that they had received any training. Those who had formal training were 44.9% whereas 21.9% were undecided and 32.2% disagreed that they had formal training. Forty four point nine percent (44.5%) had informal training, while 20.5% were undecided, whereas above one third (34.9%) of the respondents had not received any formal training.

On training collaboration, most (71.9%) of the respondents disagreed on having any training collaboration with any training institute, software developers or any training body, 0.7% were undecided, while 27.4% agreed that the industry had a training collaboration with other training bodies. Out of those who received the training, 42.5% had either certificate or ordinary diploma in CAD-CAM technology, 21.9% remained undecided, while 35.6% disagreed that they had either certificate or ordinary diploma in CAD-CAM technology. Nearly half (43.8%) of the respondents had higher national diploma, 21.9% were undecided while 34.3% indicated that they did not possess either HND/degree and above.

CAD-CAM competence result also indicated an average of 53.28% of the staff agreed that they are not competent in operating most of the listed CAD-CAM program, but less than half (46.72%) of them indicated that they are competent. But some of the old software such as Corel draw, adobe Photoshop and adobe illustrator had the highest responses of those who indicated that they are competent in using them. Result on the availability of CAD-CAM programs shows that most (44.5%) of the respondents are aware of the use of the technology in textile industries, thirty three point six percent (33.6%) indicates that they were not aware of such technology, while 21.9% were not sure of the CAD-CAM programs.

Additionally, less than half (45.2%) of the respondents concurred that they were aware of CAD-CAM programs in the textile industries, whereas 21.9% were not sure, while close to one third (32.9%) of the respondents disagreed that the technology exists in the industries under study. On whether the CAD-CAM programs are available, nearly half (45.2%) of the respondents agreed that the CAD-CAM are available, but 32.9% of the respondents disagreed that the software are available, whereas 21.9% said they were not sure. Forty eight percent (48%) of the respondent agreed that they have access to CAD-CAM programs, 30.8% disagreed and 22.6% were not sure. The study found that most (41%) of the workers had 0-13 years of service, 40% 14-28, while very few (19%) had spent more than 29 years and above.

The result from table 4.6 revealed more than two third (72.6%) disagreed that leadership is supportive of the use of CAD-CAM, only 9.6% agreed, whereas 17.8% were undecided. Most (71.9%) of the respondents disagreed that the leadership in the industries are CAD-CAM flexible in their opinion, while 27.4% agreed and 0.7% was undecided. Less than half (45.5%) of respondents indicated that leadership is CAD-CAM innovative, while 37.0% disagreed and 17.8% of the respondents were undecided. Most of the respondents (72.6%) disagreed that the industries' leadership support CAD-CAM only 9.6% agreed, whereas 17.8% were undecided. Most (87.4%) of the respondent disagreed that textile industries leadership employs CAD-CAM experts, only 0.7% agreed, whereas 8.9% were undecided.

Most of the respondents (72.6%) disagreed that the industries are mass producing textile materials, 9.6% agreed while 17.8% were undecided. Similarly, 72.9% disagreed that the industries produce quality textile materials, 27.4% agreed and 0.7% was undecided. Less than half (45.2%) of the respondents agreed that the textile industries have high sales, 37.0% disagreed, whereas 17.8% were undecided. Most (73.6%) of the respondents disagreed that the industries were exporting textile materials, 9.7% agreed and 17.8% were undecided. Majority (90.4%) of the respondents disagreed that the industries have sufficient funds to purchase the CAD-CAM technology, 0.7% agreed. and 8.9% were undecided. Majority (71.9%) of the respondents disagreed that the industries are investing in CAD-CAM technology, 27.4% agreed and 0.7% were undecided.

The study used Pearson product moment correlation on CAD-CAM training, CAD-CAM competency, work experience and CAD-CAM program, with CAD-CAM usage. The results from the correlation matrix indicated that four out of the independent variables have a strong and positive association with CAD-CAM usage. CAD-CAM training ($r=0.973$, $p<0.00$), CAD-CAM competence ($r=908$, $p< 0.00$), CAD-CAM work experience ($r=0.859$, $p< 0.00$) and Availability of programs ($r=0.897$, $p< 0.00$), except for leadership style ($r=-0.066$, $p> 0.43$) and financial status ($r=-0.063$, $p> 0.45$) that had negatively and are not statically significant.

Regression was also performed, the results indicated that there was a positive and strong relationship (R^2=0.975) between the independent variables and dependent variable CAD-CAM usage. Moderating and mediating variables were also tested to find out whether there was any influence of a moderator or effect of mediator on the relation between the independent variables and dependent variables. However the result showed that neither the financial status ($p>0.49>0.05$) nor the leadership style ($p>0.055>0.05$) was statistically significant, and both had zeros in their confident interval.

The six study hypotheses were also tested. Four (CAD-CAM training, and CAD-CAM competency, work experience and Availability of CAD-CAM program) out of the six null hypotheses have been rejected, but the remaining two (leadership style and financial status) were not rejected.

CHAPTER FIVE: DISCUSSION

5.1 Introduction

This chapter comprises of the discussion of findings which in turn aids the researcher to explain the implication of the findings. It also helps the study to infer on the level of CAD-CAM training, competency, and usage in textile industries of Northern Nigerian. The chapter has presented these discussions in order of the study objectives.

5.2 Discussion on Descriptive and Correlational Findings

The descriptive and correlational findings have helped the study in providing the overall view of the attributes in training, competency, work experience, CAD-CAM program and the level of CAD-CAM usage in the textile industries of Northern Nigeria.

5.2.1 CAD-CAM Training and CAD-CAM Usage in Textile Industries of Northern Nigeria

CAD-CAM training responses showed that most (45.9%) of the respondents received training, 45.1% of the respondents had received different mode of training; ranging from formal to informal. Prior studies have noted that the growth of a nation depends, to a larger extent, on the level of the resourcefulness of the people which, to a great degree, relates to the quality of the training (Bukar & Timothy, 2013).

The findings of this study concurs with Bukar and Timothy (2013), because this study has shown that there are more people that received informal training (learning on the job) than those with formal training. Among those who had received formal training, 43.8% had a degree and above and 42.5% had certificates and diplomas.

This finding is comparable to other research in different parts of the world. In South Africa, Northern America, Western Europe, Asia/Pacific, and the rest of the world, several studies have revealed that there are textile industries' workers who have received some level of formal training in diverse CAD-CAM packages (Makinde, Mpofu, & Popoola, 2014; Wallace, Trkay, Peery, Chivers, & Radniecki., 2018; Thomson, et al., 2018; Zhang, 2014; Yixian, et al.,2014; Afshari et al., 2011). However, the current study disagrees that there was any training or collaboration between Nigeria's textile industries and the institution of learning or CAD-CAM software developers that would help in improving the training of workers in CAD-CAM technologies.

In the Africa regions, for instance, studies in East Africa have revealed that there are more formally trained workers in fashion and textile design (Oigo, 2012; Kamau, 2012; Isika, 2014; Massa, 2015; Omondi, et al. 2016). Similarly, studies around North Africa and South Africa on trained textile staff revealed that the workers have received different mode of training such as formal and informal (Dzikite, 2015). Studies in West Africa are consistent with the current study findings that textile staff received different mode of training in CAD-CAM program (Eric Bruce-Amartey Jnr, 2014; Kelani & Gado, 2018).

Although the responses showed that there was training, the respondents who received both the formal and the informal training were less than half (45.2%) of the total sample size. This implies that there is the need for more staff training programs in CAD-CAM technology in the textile industries of Northern Nigeria. Related findings also reported that lack of training, capital, and flexibility to change in production methods were reported to be hampering CAD-CAM usage (Abdi & Achache, 2018; Eliassen, 2012; Ibeagha, et al., 2015).

Additionally, it is not surprising that in Africa, a good percentage of textile industries' workers lack the necessary training in CAD-CAM program (Mado-alabi, 2014). Kamau (2012) notes that there are inadequate training and staff development programs on state-of- the art technologies (CAD-CAM) to undertake a textile and apparel CAD-related program. More so, Fukunishi's (2014) studies on South Africa and Mauritius concluded that lack of availability of CAD-CAM program and CAD-CAM training is still prevalent among most African countries.

A study in South Africa's mining industries on CAD-CAM usage indicates that the industries are marred by inadequate training that is leading to skills shortage (Makinde, Mpofu, & Popoola, 2014). Similarly, empirical investigations have shown that the employees of textile and apparel industries in developing and low-income countries lack formal training with the high level of incompatible skills (Staritz & Frederick, 2016). These findings on Nigerian textile industries may probably be explained by the country over-dependency on the oil sector instead of investing in other sectors such as the textile industries CAD-CAM technology (Kraak, 2015).

The correlation analysis of CAD-CAM training indicated a strong and positive association ($r=0.973, p<0.01$) with CAD-CAM usage. This suggests that when textile staffs are trained in CAD-CAM technology, there might be an improvement in their level of CAD-CAM usage. The finding is further supported by Kisato (2014) who opines that a person with higher education stands a better chance of manipulating these advanced technologies than those who are not. This has further been confirmed by Hamma-adama, Kouider, & Salman (2018) who state that there was a relationship between the level of training and CAD-CAM practice.

5.2.2 CAD-CAM Competency of Staff and CAD-CAM Usage in Textile Industries of Northern Nigeria

The findings from the study indicate that less than half of the respondents are competent in applying the software in the design and production process. Studies on competency have showed that the skill an industry needs to make a difference in the production of textile materials for export purposes can only be measured by the level of workers' technological performance in production (Ibeagha, et al., 2015; Mboya & Kazungu, 2015). For competency to be founded, an instrument on the competence scale is essential (Russanti, Nurlaela, & Basuki, 2018). Hence, the study sets to find out whether the workers are able to perform some task from ten listed CAD-CAM programs to indicate their level of competency.

The study findings revealed that majority of the respondents were not competent in applying most of the sampled CAD-CAM programs in design and production processes. Out of the ten different software used only few of them the workers indicated that they were able to use successfully.

The findings of this study agree with Fakunishi (2013) assertion that the bulk of textile industries workers are not competent in manipulating the CAD-CAM technology because some of the technologies are advanced and would need some level of training. Lack of training could also be responsible for the lack of competent workers in this study. This is consistent with a study by Mboya & Kazungu (2015) which reveals that the scope and depth of skills required for industrial development and economic growth need a daily upgrade.

However, it is worthy to note that software like Corel Draw, Adobe Photoshop, and adobe illustrator recorded a significant number of those who are competent in their application. The reason for the high response rate was probably because these software packages are the oldest in the market, hence popular, easy to maneuver, cheapest, available and do not need much technical savvy. This study corroborated with Kisato (2014) who reported that the most popular and older technology tends to have many users than those with latest and advanced technologies. This suggests that textile and fashion industries need to prioritize technology training amongst workers for skill upgrade and to explore and implement new technologies by adopting new marketing tools and products (Bhaskaran, 2016; Kisato 2014).

The study further performed correlation analysis to ascertain whether there is any association between competency level and CAD-CAM usage. The findings on staff competency in CAD-CAM software indicate that, six out of the ten items (Lectra, AVA, Corel Draw, Adobe Illustrator, Adobe Photoshop, and any others) had positive and strong association with CAD-CAM usage, while the remaining four (Textile Vision, Prodesign, Proweave, and Prima Vision) are weak but positively associated with CAD-CAM usage. This finding is similarly corroborated with Ezeji (2018) who assert that there was a significant relationship between the level of CAD-CAM competency and ‘use of CAD in design in south-east Nigeria’. This suggests that there might be an increase in the level of CAD-CAM usage when workers’ competency in CAD-CAM technology level improves. The study finding is in consonant with Mado-alabi (2014), Fukunishi (2014) Kaindi (2014,) Cruz, et al. (2014) and Erigbe et al. (2016) who opined that the setback experienced in the use of CAD-CAM technology is due to the level of staff competency.

5.2.3 Work Experience and CAD-CAM Usage in Textile Industries of Northern Nigeria

The findings on work experience revealed that out of the 146 respondents drawn from the textile industries in Northern Nigeria, only (41%) of the respondents had 0-13years of experience, 40% had 14-28 years of work experience, while the remaining 19% had worked for 29 years and above. This implies that the majority of workers who are textile designers and technologists in the textile industries of Northern Nigeria have spent two third (0-23yrs) of their years working. This suggests that there are many newly employed textile designers and technologists' in the textile industries of Northern Nigeria who could be relatively young and also computer savvy.

On the contrary, research findings of Ocampo, Hernández-Matías, and Vizán (2017) on the work experience of textile industries in America revealed that there are more new workers with ⅓ (0-13yrs) of years of service than those with more years of experience. When juxtaposing the two separate findings, it is clear that there are higher numbers of workers in the textile industries of Northern Nigeria who had more years of experience than the ones in American textile industries.

Additionally, the correlation analysis of work experience with CAD-CAM usage indicates that there was a strong and positive association between work experience and CAD-CAM usage ($r=0.859$, $p<0.02$). This implies that the more the years of experiences the more the CAD-CAM program usage. The study finding corroborates with Ghavifekr and Rosdy (2015) who states that there is a relationship between work experience and effective use of technology in institutions of learning.

5.2.4 Availability of CAD-CAM Programs and CAD-CAM Usage in Textile Industries of Northern Nigeria

The descriptive analysis of 146 respondents revealed that there were 83 (56.8%) technologists, 55 (37.7%) textile designers and 8 (5.5%) CEO's in textile industries under study. The findings on CAD-CAM program indicated that majority (45.5%) of the respondents were aware of the CAD-CAM technology. The study results agreed with Fukunishi (2014) studies which showed that the majority of respondents in most African countries were aware of CAD-CAM technology.

Less than half (45.2%) of the respondents' indicated that CAD-CAM programs are available, while 21.9% of respondents showed that there are no CAD-CAM programs in their industries. This means that there is an appreciable percentage of CAD-CAM programs. This assertion was also reported by Balogun, Otanocha, & Ibhadode's, (2018) study on firms in Nigeria, which observed that the CAD-CAM technology is gradually becoming available for fabricating of parts in some production sectors, but that the level of its availability is yet to be ascertained.

The findings by Balogun et al, (2018) agree with the findings of this study despite the fact that the finding from this study showed that only less than half (50%) of the sample size agreed that the CAD-CAM programs are available. This suggests that there is still a scarcity of the technology among the industries under study. The findings relating to the availability of CAD-CAM program is similar to other studies by Kabouridis, Giannopoulos and Tsirkas, (2015) on the development of course interconnections within mechanical engineering training program via single

CAD/CAM/CAE software in the Department of Mechanical Engineering of the Technological Institute of Western Greece which revealed that despite the compatibility of CAD-CAM software with today's computer, yet there exists a paucity of CAD-CAM program in use.

Again, one might think that lack of availability of CAD-CAM program by most of the industries might be as a result of their prices. But Johanna, Scheitz, Peck, & Groban, (2018) assert that there seems to be a drastic drop in the price of CAD-CAM program today as compared to when it came out first. Johanna, et al. (2018) further attribute the drop in the price of CAD-CAM program to high level of competition among software developers.

Additionally, the finding of this study is also consistent with other research by Hamma-adama, Kouider, & Salman (2018), who established that there is sufficient computer hardware in many institutions, establishments, and companies, but that they lack the available CAD-CAM software packages. The correlation analysis on the availability of CAD-CAM program also indicates that there was a strong and positive association between CAD-CAM awareness, availability of CAD-CAM use and CAD-CAM usage.

However, the study finding indicates a weak and positive association between the availability of CAD-CAM software and CAD-CAM usage. This implies that the more the level of awareness and availability of the CAD-CAM program, the more the usage. This discovery corroborates with Hamma-adama, Kouider, & Salman (2018) who state that there is a significant correlation between software availability and the implementation of CAD-CAM technology.

5.2.5 Organizational Leadership Influence on CAD-CAM Usage in Textile Industries of Northern Nigeria

The study also sought to find out whether mediating variables (leadership style) explain the relationship that exists between independent variables and dependent variables. That is, if the leadership trained the workers in CAD-CAM program they are likely to use technology well. This study findings on leadership style indicates that majority of the respondents said that the leadership style does not support CAD-CAM usage.

Previous studies have revealed that the factors that hinder the use of CAD-CAM in textile industries are lack of leadership flexibility and willingness to change; in technology upgrade, workers training, organizational policies and financial status (Bhaskaran, 2016; Mboya et al, 2015). This implies that it is possible for leadership style to mediate the relationship between CAD-CAM training, staff competency CAD-CAM, work experience, in CAD-CAM program and CAD-CAM usage.

This current study indicates that the leadership style lacks CAD-CAM flexibility and innovations. The study also established that the leadership style does not support training as well as employment of CAD-CAM experts. These study findings have been corroborated by that of Manage, Asil, and Naralan (2016) who assert that lack of leadership support in training, inexperienced staff, lack of commitment on leaders' part and poor leadership style might be responsible for the backwardness in CAD-CAM technology usage. The findings also concur with Mboya & Kazungu (2015) who indicate that companies' leadership need to strategically enhance their staff capabilities through supported training of staff, employment of CAD-CAM experts and technology investment to appropriate company technological challenges.

The findings on leadership style from this study reveal that constructs such as leadership support to CAD-CAM use, leadership flexible CAD-CAM, leadership CAD-CAM innovation, CAD-CAM training support, and CAD-CAM expert employment by leaders are negatively and moderately associated with CAD-CAM usage. This implies that though there is an association between leadership style and CAD-CAM usage, but the association does not have any significant impact on the CAD-CAM usage in textile industreis of Northern Nigeria.

Similarly, the current study findings have agreed with Chen and Silverthorne's (2005) study on the impact of leadership style and technology usage among workers which indicates that leadership is negatively correlated with use of technology by industries. This implies that the use of CAD-CAM technology in textile industries of Northern Nigeria is independent on the leadership style.

However, the study finding differs with that of Hsien- Hsien-Che Lee and Yi-Wen Liu (2008) who state that the leadership style has a positive association with the organizational innovative use of CAD-CAM technologies. Additionally, the findings from the study also disagree with Farahnak, Ehrhart, Torres, and Aarons (2019) who assert that leadership is widely seen as the main determinant of technology usage in any organization.

This variation in the result of the finding may probably be caused by the nature of the leadership style used in the study. A leadership style that brings out the best of employees is the one which influences performance with reward and punishment as well as with a good work environment (Kerario, 2013).

5.2.6 Financial Influence on CAD-CAM Usage in Textile Industries of Northern Nigeria

The study also sought to find out whether moderating (financial status) strengthens the relationship that exits between independent variables and dependent variables. This implies that if the textile industries have enough money they are most likely to procure CAD-CAM technology thereby facilitating its use in production of textile materials in textile industries of Northern Nigeria.

The findings of the current study reveal that the industry is not mass producing textile materials probably due to the absence of CAD-CAM technology among some of the textile industries. The CAD-CAM technology integration by most organizations is the function of the size of the industry, financial strength as well as its managerial skills (Asil & Abdullah, 2016; Olajide et al., (2015). This assertion suggests that financial status of industries might have likely moderated the relationship between the CAD-CAM training, staff competency in CAD-CAM, work experience, CAD-CAM program and CAD-CAM usage.

The responses also show that the industries lack export capacity and sufficient funds to purchase a CAD-CAM program as well as a financial investment. These concurred with a study by Gaith, Rashid, & Ismail (2012) who observed that many textile industries lack adequate budgets for CAD-CAM technology and, as a result, it hampered the level of usage in the industry. The correlation analysis findings indicated that all the items (mass production, quality goods, high sales, sufficient funds, and investment in CAD-CAM program) were all negatively and moderately associated with CAD-CAM usage. The emerging issue from findings is the need for fashion and textile industries to ensure that they strategically invest in new technologies (Kisato, 2014).

The study findings correspond with Nayak et al's., (2015) who revealed that there is a negative and moderate association between investment in workers skills upgrades and CAD-CAM usage in Nigeria. This may be due to the recession experienced in the country before the time of the study. Textile industries have suffered greatly due to two consecutive recession periods that Nigeria experienced between 2015-2018 (Advisory, 2017; Akira, 2014). Most industries in Nigeria are poorly funded and lack investment capacity in CAD-CAM technology (Olajide, et al., 2015).

The findings of this study are consistent with other research studies which also found a negative and non-significant relationship between financial strength and technology application (Gathecha, 2016). The current study findings disagree with that of Gaith, et al. (2012) and Munjal, Requejo, and Kundu (2018) who opine that financial status and investment have a positive and moderate associated with CAD-CAM usage.

5.2.7 Dependent Variables Usage (Frequency and Efficiency)

Findings from the dependent variables usage revealed that less than half of the respondents are efficient in CAD-CAM technology. Similarly, less than half of the respondent also indicated that they can use the technology frequently. This implies that there is low level of CAD-CAM technology in textile industries of Northern Nigeria. this finding agreed with Ogundele, Chete, Adeoti and Adeyinka (2014) who also note that there is low a low capacity utilization of CAD-CAM technology thus, undermining the mass production of export quantity. Also Onuoha (2013) states that in Nigeria, the use of CAD-CAM in textile production is at a very slow pace due to lack of software and knowledge of its application thereby leading to incompetence.

5.3 Regression Analysis for CAD-CAM Training, Competency and Usage

The regression analysis indicates that there was a positive relationship between the CAD-CAM training, CAD-CAM competency, work experience, availability of CAD-CAM program, leadership style and financial status of the industries with CAD-CAM usage. This means that the independent variables predict 95.9% variation of CAD-CAM usage in textile industries of Northern Nigeria. The remaining 4.1% can be explained by other determinants. It can, therefore, be inferred that there was a strong relationship between the independent variables and the dependent variables.

The model of fitness from the regression analysis shows that CAD-CAM training, CAD-CAM competency, work experience availability of CAD-CAM program, on CAD-CAM usage in textile industries of Northern Nigeria is significant. And the coefficient of determination similarly indicates that there was a positive relationship between predicting variables (CAD-CAM training, staff competency, work experience and availability of CAD-CAM program) and CAD-CAM usage in textile industries of Northern Nigeria. This suggests that a unit increase in the predicting variables would yield a positive unit increase on CAD-CAM usage in textile industries of Northern Nigeria.

The study findings reveal that both the moderating and mediating variables were not statistically significant. This suggests that both the financial status and leadership style of the industries have no moderating or mediating impact on CAD-CAM usage in the textile industries of Northern Nigeria. It can further be inferred that the study result shows that neither the mediating variable was able to explain nor moderating variables was able to strengthen the relationship between independent and dependent variables.

5.4 Hypotheses Test for CAD-CAM Training, Competency and Usage

Hypotheses are used in testing whether relationship exists between two variables. The study has tested six hypotheses to find out whether they are significant. The relationships tested are basically correlational in nature. The study shows that four out of the six null hypotheses (CAD-CAM training, staff competency work experience and availability of CAD-CAM program) are statistically significant, hence the study rejected them while the remaining two hypotheses, leadership style and financial status of the industries, were not statistically significant and were not rejected. This implies that CAD-CAM training, staff competency; work experience and availability of CAD-CAM program can contribute positively to the use of CAD-CAM in textile industries of Northern Nigeria.

5.5 Summary of the Discussion

The chapter discusses the study findings according to the objectives of the study. The chapter also uses related literature to support the finding from the study. The study has found that the textile industries of Northern Nigeria have more textile technologists than textile designers, disagreeing with other related literature reviewed in this study. Contrary to other studies, this study has also found that there was awareness of CAD-CAM program, though the technologies are very scarce in most of the industries, and very few of the industries under study are using it.

Majority of the workers in the textile industries have adequate work experience of 0-23years in the service when compared to other related studies, and only a few of them have been in the service for 29years or above. The workers had received both formal and informal training, even though most of them had received an informal training method. There was a low level of competence among the workers in CAD-CAM software such as; lectra, AVA textile vision, pro-design, pro-weave, prima vision, but only older CAD-CAM program such as Corel Draw, adobe illustrator and Photoshop had a high level of workers competence.

Leadership style and organizational financial status show no significant relationship with CAD-CAM usage. Hence, it contributes to lack of CAD-CAM program usage in most of the textile industries. The discussion elucidated that all the independent variables are statistically significant predictor of the dependent variable in the model. Hence, the study rejected four of the hypotheses and retained two that are not significant at the alpha level of 0.05%. This implies that only availability of CAD-CAM program, work experience, CAD-CAM training, and Staff competencies are true predictors of CAD-CAM.-CAM usage. The leadership style and financial status of the industries do not influence the relationship that exists between the predictor and CAD-CAM usage.

Additionally, the study has found that there is lack of collaboration between textile industries and training bodies such as textile institutions of learning or software developers. This is contrary to the several studies in the developed countries which pointed out the need for collaboration among the textile industries, government and institutions of learning (triple helix model). However, there is little or no mention of the link between the textiles industries with other training bodies as an impacting factor on CAD-CAM usage in most studies in Nigeria.

CHAPTER SIX: SUMMARY, CONCLUSION, AND RECOMMENDATIONS

6.1 Introduction

This chapter presents the summary of the key findings on CAD-CAM training, competency, and usage in textile industries of Northern Nigeria. It also draws conclusions from the study and proposes recommendation for policy, practice and further studies.

6.2 Summary of Findings

The purpose of the study was to assess the level of computer-aided design and computer aided manufacturing training, competency, and usage in textile industries of Northern Nigeria in order to develop a training model for CAD-CAM usage in the textile industries. The study, therefore, profiled textile designers, technologists and COE's from eight textile industries of Northern Nigeria using stratified, census and random sampling techniques. The study employed a cross-sectional descriptive survey to collect quantitative data from the respondents. The industries were purposefully sampled.

Out of the 152 questionnaires, only 146 were duly filled, received and analyzed generating 96.1% response rate. The data were analyzed quantitatively using statistical package for social science (SPSS) 20. The findings of the study were established through the responses generated from the respondents. The main findings based on the objective are presented as follows;

6.2.1 Objective One: CAD-CAM Training and CAD-CAM Usage in Textile Industries of Northern Nigeria

The objective one identified the level of CAD-CAM training received and CAD-CAM usage in textile industries of Northern Nigerian. It was also established that most (44.2%) of the workers received either formal or informal CAD-CAM training. There are more workers who received informal training (learning on the job) than those that received formal training. However, there is no training collaboration between textile industries and the institutions of learning or CAD-CAM software developers to help in improving the skills of workers in CAD-CAM technologies. Additionally, among those who received formal training and had a degree and above were (45.8%), while those who had certificates and diplomas were 42.5%. The workers who had received both the formal and the informal training were less than half (44.2%) of the total sample size.

The study has established that CAD-CAM training is strongly and positively associated with CAD-CAM usage. This implies that when training among textile workers improves there will be an improvement in the level of CAD-CAM usage among textile workers in textile industries of Northern Nigeria, hence there is a need for more staff training program in CAD-CAM technology.

6.2.2 Objective Two: CAD-CAM Competency and CAD-CAM Usage in Textile Industries of Northern Nigeria

Objective two examined the competencies of textile staff and CAD-CAM usage in textile industries of Northern Nigeria. The study has established that out of the ten different software used, majority of the respondents were not competent in applying them in design and production processes. However, it is interesting to note that software like Corel Draw, Adobe Photoshop, and adobe illustrator recorded a significant number of those who are competent in their application. The reason for the high response rate was probably because they were among the oldest, popular, easy to maneuver, cheapest, readily available and do not require much technical savvy.

The correlation of staff competency on CAD-CAM software showed that six (Lectra, AVA, Corel Draw, Adobe Illustrator, Adobe Photoshop) out of the ten items showed a positive and strong association, while the rest (Textile Vision, Prodesign, Proweave, and Prima Vision) showed a weak but positive association with CAD-CAM usage. The over-all correlation result indicated that a positive and strong association exists between staff competency and CAD-CAM usage. This demonstrates that staff competency is key to CAD-CAM usage in textile industries.

6.2.3 Objective Three: Work Experience and CAD-CAM Usage in Textile Industries of Northern Nigeria

The objective determined the relationship between work experience and CAD-CAM usage in textile industries of Northern Nigeria. The study has established that out of the 146 respondents drawn from the textile industries in Northern Nigeria, 41% of the respondents had 0-13years, 40% had 14-28 years working experience, and the remaining 19% had worked for 29 years and above. This suggests that the majority of workers who are textile designers and technologists in the textile industries of Northern Nigeria have spent two third (0-23yrs) of their working years in the textile industries under study. The study also establishes a strong and positive association between work experience and CAD-CAM usage. This implies that the worker's experience can impact positively on the level of one's CAD-CAM usage.

6.2.4 Objective Four: Availability of CAD-CAM Program and CAD-CAM Usage in Textile Industries of Northern Nigeria

The objective four established the relationship between the availability of CAD-CAM program and CAD-CAM usage in textile industries of Northern Nigeria. The study established that most (45.5%) of the respondents are aware of the CAD-CAM program. However, only a few of the CAD-CAM programs are in use in most of the industries. The numbers of the workers that use the CAD-CAM program are less than half (45.9%) of the total sample size.

The study further established an association between CAD-CAM program and CAD-CAM usage. The findings revealed a strong and positive association between CAD-CAM awareness and usage. A weak and positive association was found between the availability of CAD-CAM software and CAD-CAM usage. A positive and strong association was further established between availability to use of CAD-CAM and CAD-CAM usage. The overall results of the entire CAD-CAM program on CAD-CAM usage indicate a positive and strong association. This infers that there is a relationship between the availability of CAD-CAM program with CAD-CAM usage.

The current study concurred with some other researchers' work across the globe on the African textile industries' level of CAD-CAM program usage and that textile industries need to be equipped with the necessary technology for the necessary tasks (Hamma-adama, et al., 2018; Scheper., Wetzels., & de Ruyter., 2005). This implies that, in order to remain competitive in today's market the African textile and fashion industries need to fully embrace the technology. This study poses that a lot is still needed from the Nigerian textile and fashion industries to cover the widening gap in CAD-CAM technology usage.

6.2.5 Objective Five: Organizational Leadership Influence on CAD-CAM Usage in Textile Industries of Northern Nigeria

Objective five determined the influence of the organizational leadership on CAD-CAM usage in textile industries of Northern Nigeria. Organizational leadership was used as a mediating variable in the study to see whether it mediates the relationship between independent (availability of CAD-CAM program, work experience, CAD-CAM training, and Staff competency in CAD-CAM) and dependent variables (CAD-CAM usage). However, the findings indicated that leadership style does not have a mediating effect on CAD-CAM usage in the industries. Additionally, the study also established that leadership style of the textile industries is weak, and does not support CAD-CAM usage, which implies that leadership style is independent of CAD-CAM usage.

6.2.6 Objective Six: Financial Influence on CAD-CAM Usage in Textile Industries of Northern Nigeria

Objective seven ascertained the organizational financial influence on CAD-CAM usage in textile industries of Northern Nigeria. The financial status of the textile industries was used as moderating variables between the independents and the dependent variables in the study. The results revealed that the financial status of the textile industries has no moderating effect on the relationship between the independent and dependent variables. This suggests that the financial status is not contributing to how CAD-CAM technology is used in textile industries of Northern Nigeria.

6.2.7 Objective Seven: CAD-CAM Training Model for CAD-CAM Usage in Textile Industries

Objective seven was to develop a training model for CAD-CAM usage in the Textile Industries from the findings of the study. The study performed a multiple regression to determine the CAD-CAM training model that would best fit the textile industries. The regression coefficient results revealed that the R-value was 0.979 supported by the coefficient of determination R^2 = 0.959 and adjusted R^2 = 0.958, indicating that there was a positive relationship between the availability of CAD-CAM program, work experience, CAD-CAM training and CAD-CAM competency in industries with CAD-CAM usage.

This implies that the independent variables in the study explain 95.9% variation of CAD-CAM usage in textile industries of Northern Nigeria. This means that a unit increase in the availability of CAD-CAM program, work experience, CAD-CAM training, and CAD-CAM competency would positively increase CAD-CAM usage in textile industries of Northern Nigeria. The analysis also shows that the availability of CAD-CAM program, work experience, CAD-CAM training, and CAD-CAM competency are statistically significant.

In addition, the model of fitness showed that availability of CAD-CAM program, work experience, CAD-CAM training and CAD-CAM competency on CAD-CAM usage in textile industries of Northern Nigeria were significant. Furthermore, the coefficient of determination (R^2 =0.956) also showed that there is a positive relationship between the study variables and CAD-CAM usage in the textile industries of Northern Nigeria.

6.3 Summary of the Test of Hypotheses

The study rejected four out of six null hypotheses (CAD-CAM training, and Staff competency in CAD-CAM, work experience, availability of CAD-CAM program). Hypotheses on leadership style and financial status of the industries had a positive relationship with the dependent variable (CAD-CAM usage), it was not statistically significant, and hence the study did not reject these null hypotheses. Hence, the regression model is a good predictor of CAD-CAM usage in textile industries of Northern Nigeria.

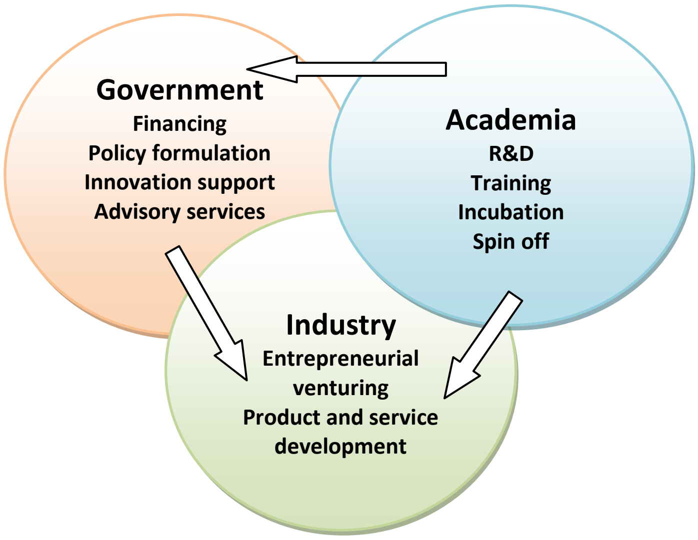

Figure 6 .1: Triple Helix Innovation Model Used by Textiles Industries

The triple helix innovation model is currently adopted by most textile industries for training in Nigeria. The model comprises of some set of interaction between the government, industry and academia. The Nigerian government provides funding to Industrial Training Fund (ITF) Board which serves as a link between tertiary institutions, student's and industries for training and verse visa. Each of the three components of the model provides the following services; the government provides the finances, formulates policies towards state-of-the-art supports as well as advisory service, while the academia provides research and development, training and spin off. The role of the industry as shown on the model is for entrepreneurial venturing product manufacturing and services development.

Several studies have shown that the model has provided a good support to the training need of most industries (Fadeyi, Maresova, Stemberkova, Afolayan, & Adeoye, 2019; Muyiwa, 2019). However, the training model has not been able to improve the industry's workers' competency in the use of CAD-CAM technology. Because, the study has also found that there is lack of training collaboration with software developers. This implies that the model is not properly addressing the aspect of informal training sector

6.4 Contribution to Knowledge

The findings of the study brought to fore certain implications which could be important to policy and practice. The study has established that there are more textile technologists than textile designers in the textile industries under study, contrary to other related literature reviewed in this study. This study also found that there were textile workers with more years of experience in this study compared to other related studies. There was more awareness of the use of technology among the workers. However, being aware of CAD-CAM technology without readily accessible CAD-CAM software is not enough to impact on effective and efficient usage in these industries. This means that there is a need for leaders to invest and make available CAD-CAM program in the industries.

This study has established that there is lack of collaboration between textile industries and training bodies such as textile institutions of learning or software developers. There is also lack of support and investment in CAD-CAM technology that are impeding CAD-CAM usage in textile industries of Northern Nigeria. Other studies have had little or no mention of the link between the textiles industries with other training bodies as an impacting factor on CAD-CAM usage,

Consequently, this calls for a concerted effort from stakeholders, the government of Nigeria and software developers to collaborate as well as organize an after sale training, especially in newly developed CAD-CAM software, since the study has shown that textile workers were only able to use the old and readily available software.

Moreover, the study has found a significant relationship between the CAD-CAM training, staff competency and work experience availability of CAD-CAM program to CAD-CAM usage. It should also be noted that the independent variables are inseparably connected with the CAD-CAM usage in the textile industries. The significant relationship established between some independent and dependent variables was what led the researcher to propose a CAD-CAM training model for the textile industries.

Besides, the model would be of immense benefit to textile industries CEOs and researchers to improve on training techniques and skills in the use of CAD-CAM technology and eventually improve their performance. The difference between the model and other training models is the incorporation of gaps such as; awareness and accessibility of CAD-CAM programs. The short term, long-term or on the job training collaboration of industries with other possible training bodies would be of benefit to the industries because their production would be maintained, without necessarily interfering with industries' production time. Why this is necessary is because the study has found that there is a high level of incompetency in new CAD-CAM software than in the old ones. This high level of incompetency in the result would have been different if there is a software developer user training collaboration.

6.5 Training Model Development Stages

Step One

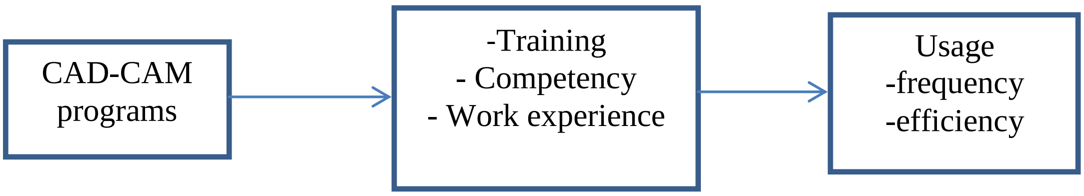

Figure 6.2: First Stage of CAD-CAM Training Model Adoption

In this study, the inputs are the CAD-CAM programs; the process is the CAD-CAM training, competency and work experience, while the output is the CAD-CAM usage. The current study has shown that it is not adequate for textile industries to have CAD-CAM programs without the necessary training, competency and experience. Hence, the above model explains that CAD-CAM program alone cannot give frequent, effective and efficient use of technology. Hence, there is a need for workers training for textile industries.

Step Two

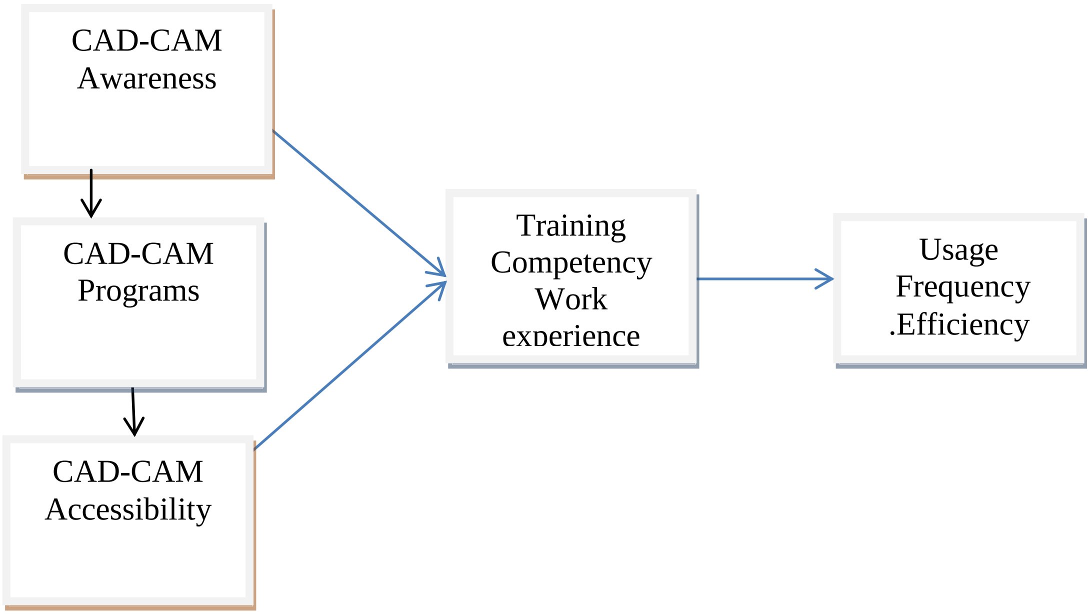

Figure 6.3: Second steps of CAD-CAM Training Model

Fig 6.2 introduces CAD-CAM awareness and accessibility as key component that leads to effective CAD-CAM usage. This study has revealed a positive and significant association between CAD-CAM usage and CAD-CAM awareness and accessibility. This implies that the industries need to acquire the necessary technology needed for design and production, get the workers to be accustomed to new technology and its processes and also to have it readily available for use in the designing and production of textile materials.

Step Three

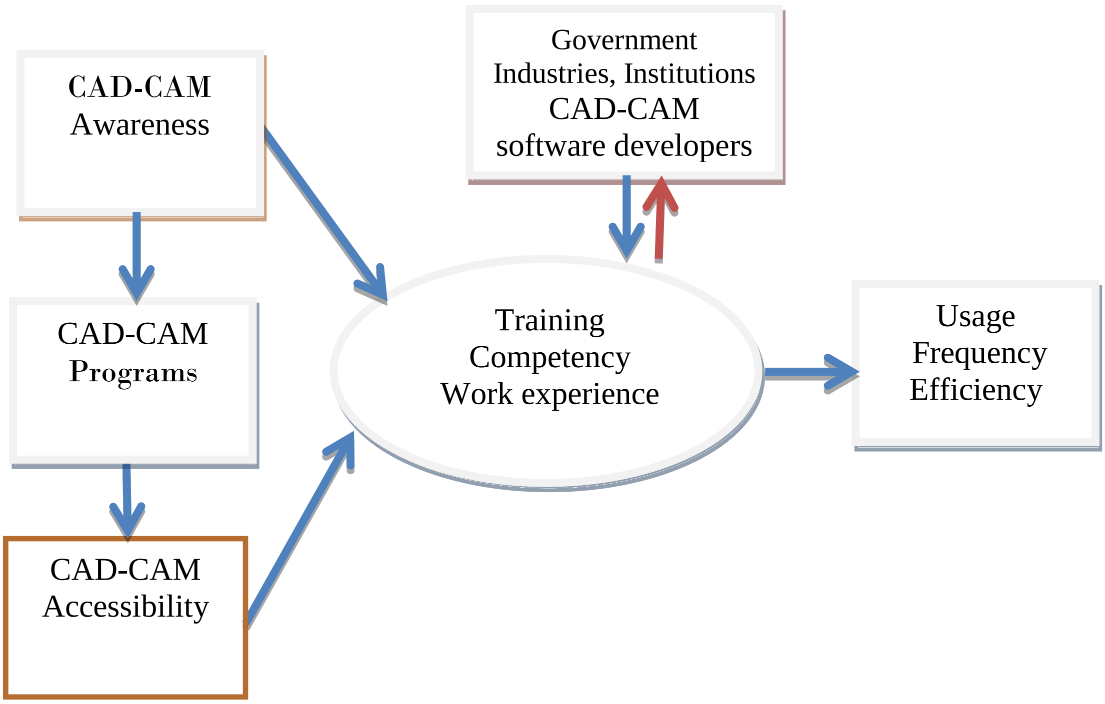

Figure 6.4: CAD-CAM Training Model for Textile Industries

Fig 6.3 shows a final step of CAD-CAM training model development for textile industries. It is proposed that collaboration between the textile industries, textile training institutions, and CAD-CAM programs and producers can bring about effective CAD-CAM usage in the textile industries.

6.6 Conclusion

The following conclusions are made base on the findings from the object;

6.6.1 CAD-CAM Training in Textile Industries of Northern Nigeria

Based on the findings, it was concluded that less than half of the workers received both formal and informal training. There are more workers that received informal training than those with formal training. Those formally trained had certificates, diplomas degrees and above. But most of the workers who had informal training were only trained on the job and not from software developers or any other collaborators. The study also revealed that CAD-CAM training has significant relationship with CAD-CAM usage in textile industries of Northern Nigerian.

6.6.2 CAD-CAM Competency in Textile Industries of Northern Nigeria

This study further concludes that most of the staff in the textile industries of Northern Nigeria lack competency in CAD-CAM technology, and only the older and popular CAD-CAM software packages such as Corel Draw, Adobe Photoshop and adobe illustrators was used in some of the textile industries. The newest software is rarely used in design and production among the textile workers in the industries in Northern Nigeria. It was also found that staff competency has significant relationship with CAD-CAM usage in textile industries of Northern Nigerian.

6.6.3 Work Experience in Textile Industries of Northern Nigeria

The study has found that most of the workers in textile industries of Northern Nigeria had more people with 23yrs of work experience than those with 24 years and above. There is significant relationship between work experience and CAD-CAM use in textile industries of Northern Nigerian. Consequently there is the likelihood that their long years of service in the workplace would help them to be more competent in their use of CAD-CAM technologies.

6.6.4 Availability of CAD-CAM Program in Textile Industries of Northern Nigeria

The findings on availability of CAD-CAM programs shows that less than half of the respondents are aware of the technology and that CAD-CAM program are available in textile industries. However, less than half of the respondents said that they have access to CAD-CAM programs. It was also found that a significant relationship exist between availability of CAD-CAM program and CAD-CAM usage in textile industries of Northern Nigerian.

6.6.5 Organizational Leadership Style in Textile Industries of Northern Nigeria

The study revealed that more than two third of the workers said that leadership style in textile industries are not supporting the use of CAD-CAM. Similarly majority of the workers also said that leaders do not employ CAD-CAM experts, and are not flexible in their opinion on CAD-CAM technologies. The study also established that leadership style in textile industries is weak, and does not have any mediating effect on CAD-CAM usage in the industries.

6.6.6 Organizational Financial Status in Textile Industries of Northern Nigeria

Findings of organizational financial status has revealed that two third of the respondents said that the industries are not producing quality textile materials and cannot mass produce. The responses also show that the industries lack export capacity and sufficient funds to purchase a CAD-CAM program as well as a financial investment. The results revealed that the financial status of the textile industries has no significant influence between the financial status and CAD-CAM usage in textile industries of Northern Nigeria.

6.7 Recommendations

From the findings of this study, the following recommendations were made for policy and practice.

6.7.1 Recommendation for Policy and Practice

i. Leaders of textile industries should encourage workers to undertake training and re-training courses in CAD-CAM technology to improve their efficiency and frequency of CAD-CAM and also to get up-to-date knowledge of the latest CAD-CAM technology.

ii. Leaders and stakeholders of textile industries should invest in CAD-CAM technology in order to make CAD-CAM technology available.

iii. Stakeholders of textile industries should invest more in training of their staff in the CAD-CAM program, in order to improve the competency of their staff.

iv. The government should create and also improve the state of public infrastructures for training and effective integration of CAD-CAM technologies to all textile industries and the marketing of their textile materials.

v. It is also pertinent that the government should encourage Public Private Partnerships, (PPPs) with software developers through promotion and after-sale training, as well as to provide financial motivations in CAD-CAM software supply and training.

vi. The study showed that there were more informal trained workers than formal. Hence, the Leadership should encourage formal training among workers through short term and long term CAD-CAM training.

vii. Stakeholders, CEO's of textile industries and government should not limit training to formal and on the job, but should collaborate with more training bodies like the software developers to improve the worker competency in new technology.

viii. Leaders of textile industries' should encourage the workers to spent longer years of service to enable them to be more competent in their use of CAD-CAM technologies.

ix. Leaders of industries and Government should make CAD-CAM program available and accessible to textile workers.

x. Leadership in textile industries should support the use of CAD-CAM and also employ CAD-CAM experts that are competent in using it.

xi. Textile industries should mass produce quality textile materials that would enable them high sales that would provide them with sufficient funds.

6.9 Recommendations for Further Studies

The study recommends the following for further research in order to fill the gaps:

i. There is a need to conduct an in-depth study on other factors that are affecting the effective and efficient use of CAD-CAM through incorporating a wider population. Textile workers' union, leaders and staff of Nigerian Federal Ministry of Investment, Commerce and Industries, institutions responsible for training textile designers could be included in the study in order to have their views on other factors affecting CAD-CAM usage in textile industries of Northern Nigeria.

ii. This study has used cross-sectional descriptive design in collecting its information; hence it would be imperative that a different research design is used to establish whether both moderating and mediating variables such as leadership and company financial status could have a significant effect on CAD-CAM usage.

iii. A similar study should also be done in other industries in a different region of the country, and other African countries, in order to have a holistic view of CAD-CAM technology practice in different countries.

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APPENDICES

APPENDIX A: Letter of Introduction

Dear Respondents.

The researcher is a PhD student from the Department of Fashion Design and Marketing, School of Applied Human Sciences, Kenyatta University. I am carrying out research on "Computer Aided Design and Computer Aided Manufacturing training, competency and usage in textile industries of Northern Nigeria". You have been selected as one of the participants in the study. Kindly assist me in providing answers to the following questions as accurately as possible.

All information provided will be treated with confidentiality. And used for academic purposes only. If you have any enquiry regarding the study, you may kindly contact the principal investigator on +2348033248493 or email to: gausasolo@gmail.com

Thank you for your participation.

Sign……………………..

Name: Gausa, Solomon

CONSENT

If you accept the above, kindly sign below as evidence for your willingness to participate in the study.

I agree to participate in this study.

Sign……………………………….. Date……………………………

Participation is purely voluntary and you have the right to withdraw from the study at any time without giving any explanation to the researcher.

THANK YOU

APPENDIX B: Research Questionnaire (Designers and Technologists)

Instruction: Please tick (/) the answer in the appropriate box

1. What is your job description in the industry

   CEO () Designers () Technologists ()

Q2: CAD-CAM Training

Instruction: Kindly rank your CAD-CAM training level. 1= strongly disagree (SD), 2= disagree (D), 3= Undecided (U), 4= Agree (A), AND 5= strongly Agree (SA)

S/No	Items	1 SD	2 D	3 U	A	5 SA
2.	I have training					
3.	I have received informal training on the job					
4.	I have received formal CADCAM					
5.	Industries collaborate with institution and software developers for CAD-CAM training.					
6.	My highest qualification in CAD-CAM training is Certificate and Diploma					
7.	My highest qualification in CAD-CAM training is above HND and Degree					

Q3: Staff competency in CAD-CAM

Instruction: Kindly indicate your competency level in using the following software 1= Very Poor (VP), 2= Poor (P), 3= Fair (F), 4= Good (G), AND 5= Very Good (VG)

S/No	**Items**	1 NVC	2 NC	3 AC	4 C	5 VC
8.	Lectra					
9.	Textile vision					
10.	AVA					
11.	Pro-Design					
12.	Pro-Weave					
13.	Corel Draw					
14.	PrimaVision					
15.	Adobe Illustrator					
16.	Adobe Photoshop					
17.	We use software other than the one mentioned above					

Q4: Availability of CAD-CAM program

Instruction: Kindly rank your CAD-CAM program availability in the following ranking; 1= strongly disagree (SD), 2= disagree (D), 3= Undecided (U), 4= Agree (A), AND 5= strongly Agree (SA)

S/No	Items	1 SD	2 D	3 U	4 A	5 SA
18.	I am aware of CAD-CAM program in the industry					
19.	The CAD-CAM software are available					
20.	I use CAD-CAM program in your production					

Q5: Work experience and CAD-CAM usage

Instruction: Kindly indicate your years of work experience in the industry in following ranking; 1= (less than 7 years), 2= (8-14 years), 3= (15-21 years), 4= (22-28 years), 5= (29 years and above)

S/No	Items	1	2	3	4	5
21.	My CAD-CAM working experience is					

Q6. Leadership style of the industries

Instruction: Kindly rank your leadership involvement in CAD-CAM program 1= strongly disagree (SD), 2= disagree (D), 3= Undecided (U), 4= Agree (A), AND 5= strongly Agree (SA)

	Leadership style of the industry	1 SD	2 D	3 U	4 A	5 SA
22.	The leadership support the use of CAD-CAM					
23.	The leadership is CAD-CAM flexible					
24.	The leadership is technologically innovative in CAD-CAM					
25.	The leadership support CAD-CAM training					
26.	The leadership employ CAD-CAM expert					

Q7. Financial status of the industries

Instruction: Kindly rank your industry's financial standing towards CAD-CAM program procurement 1= strongly disagree (SD), 2= disagree (D),
3= Undecided (U), 4= Agree (A), AND 5= strongly Agree (SA)

	Financial status of the industry	1 SD	2 D	3 U	4 A	5 SA
	Production					
27.	We mass produced and can afford procuring CADCAM program					
28.	The industry produces a high quality of goods,and can afford procuring CADCAM program					
Sales						
29.	We have high sales, and can afford procuring CADCAM program					
30.	The industry is capable of exporting, so we can afford procuring CADCAM program					
Profit						
31.	The textile industry has sufficient financial resources, and can afford procuring CADCAM program					
32.	The textile industry always invests enough money to buy the needed CAD-CAM technology					

Q8: CAD-CAM usage

Instruction: Kindly rank your industry's level of efficiency and frequent of CAD-CAM usage 1= strongly disagree (SD), 2= disagree (D), 3= Undecided (U), 4= Agree (A), AND 5= strongly Agree (SA)

	Items	1 SD	2 D	3 U	4 A	5 SA
33	There is high efficient Use of CAD-CAM technology					
34	CAD-CAM technology is Use Frequently					

Thank you for your cooperation

APPENDIX C: Research Questionnaire (CEOs)

Instruction: Please tick (/) the answer in the appropriate box

35. What is your job description in the industry

CEO () Designers () Technologists ()

Q2: Availability of CAD-CAM program

Instruction: Kindly rank your industry's CAD-CAM program availability in the following ranking; 1= strongly disagree (SD), 2= disagree (D), 3= Undecided (U), 4= Agree (A), AND 5= strongly Agree (SA)

S/No	Items	1 SD	2 D	3 U	4 A	5 SA
36.	I am aware of CAD-CAM program in the industry					
37.	CAD-CAM software are available					
38.	CAD-CAM is use program in production					

Q2: Work experience and CAD-CAM usage

Instruction: Kindly indicate your years of work experience in the industry in following ranking; 1= (less than 7years), 2= (8-14 years), 3= (15-21 years), 4= (22-28 years), 5= (29 years and above)

S/No	Items	1	2	3	4	5
39.	My CAD-CAM working experience is					

Q3: CAD-CAM Training

Instruction: Kindly rank your staff CAD-CAM training level. 1= strongly disagree (SD), 2= disagree (D), 3= Undecided (U), 4= Agree (A), AND 5= strongly Agree (SA)

S/No	Items	1 SD	2 D	3 U	A	5 SA
40.	I have training					
41.	I have received informal training on the job					
42.	I have received formal CADCAM					
43.	Industries collaborated with institution for the training and software developers					
44.	My highest qualification in CAD-CAM training is Certificate and Diploma					
45.	My highest qualification in CAD-CAM training is above HND and Degree					

Q4: Staff competency in CAD-CAM

Instruction: Kindly indicate your staff competency level in using the following software 1= Very Poor (VP), 2= Poor (P), 3= Fair (F), 4= Good (G), AND 5= Very Good (VG)

S/No	**Items**	1 NV C	2 NC	3 AC	4 C	5 VC
46.	Lectra					
47.	Textile vision					
48.	AVA					
49.	Pro-Design					
50.	Pro-Weave					
51.	Corel Draw					
52.	PrimaVision					
53.	Adobe Illustrator					
54.	Adobe Photoshop					
55.	They are using software other than the one mentioned above					

Q6. Leadership style of the industries

Instruction: Kindly rank your leadership involvement in CAD-CAM program 1= strongly disagree (SD), 2= disagree (D), 3= Undecided (U), 4= Agree (A), AND 5= strongly Agree (SA)

	Leadership style of the industry	1 SD	2 D	3 U	4 A	5 SA
56.	The leadership support the use of CAD-CAM					
57.	The leadership is CAD-CAM flexible					
58.	The leadership is technologically innovative in CAD-CAM					
59.	The leadership support CAD-CAM training					
60.	The leadership employ CAD-CAM expert					

Q7. Financial status of the industries

Instruction: Kindly rank your industry's financial standing towards CAD-CAM program procurement 1= strongly disagree (SD), 2= disagree (D), 3= Undecided (U), 4= Agree (A), AND 5= strongly Agree (SA)

	Financial status of the industry	1 SD	2 D	3 U	4 A	5 SA
	Production					
61.	We mass produced, and can afford procuring CADCAM program					
62.	The industry produces a high quality of goods, and can afford procuring CADCAM program					
Sales						
63.	We have high sales, and can afford procuring CADCAM program					
64.	The industry is capable of exporting, we can afford procuring CADCAM program					
Profit						
65.	The textile industry has sufficient financial resources, and can afford procuring CADCAM program					
66.	The textile industry always invests enough money to buy the needed CAD-CAM technology					

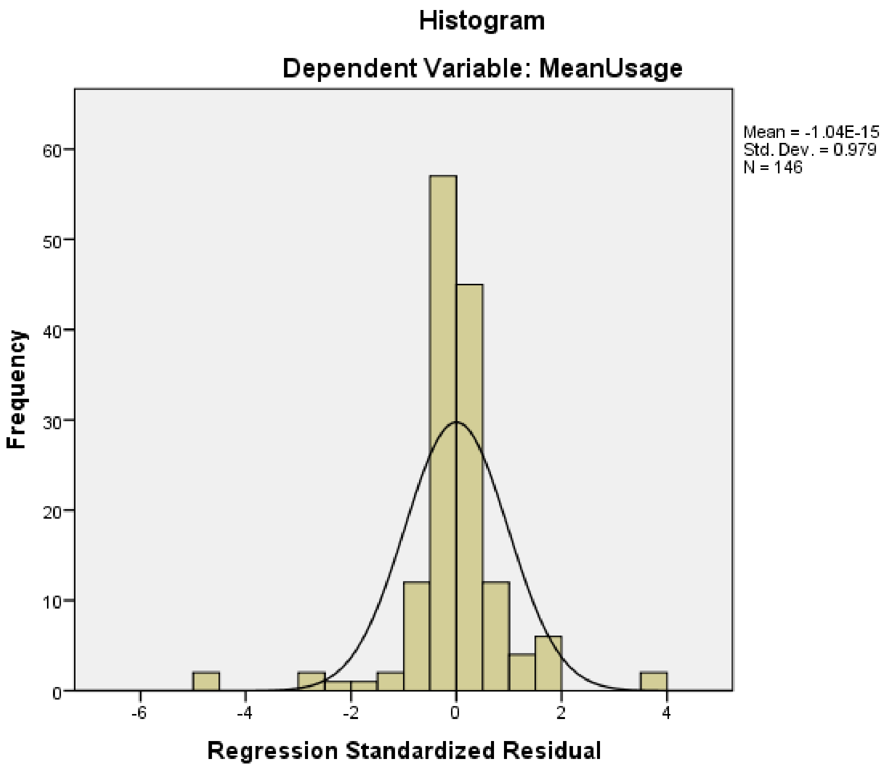
Q7: CAD-CAM usage

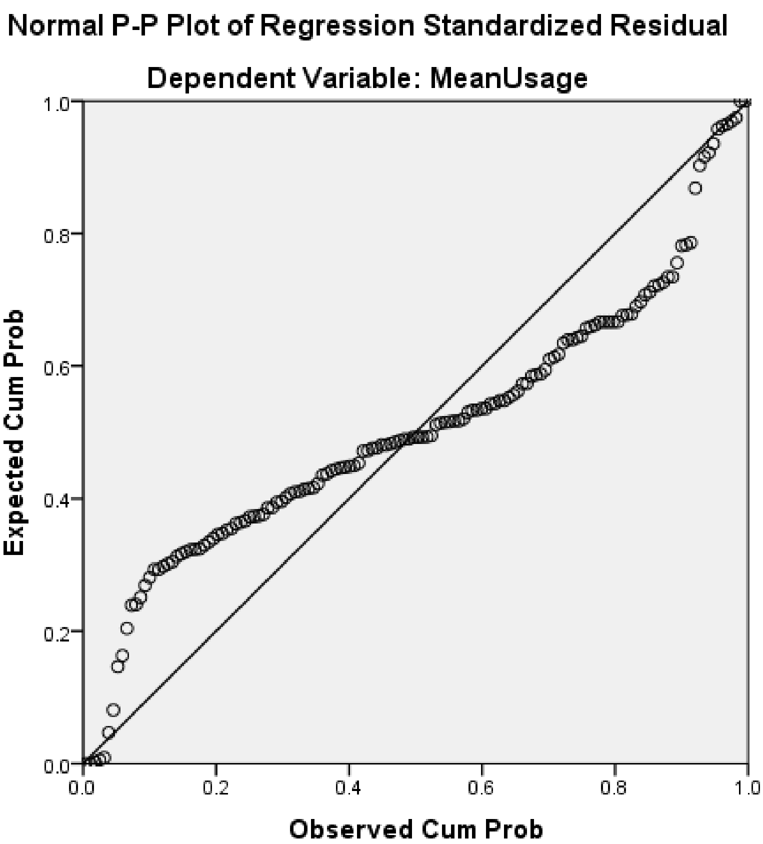
Instruction: Kindly rank your industry's level of efficiency and frequent of CAD-CAM usage 1= strongly disagree (SD), 2= disagree (D), 3= Undecided (U), 4= Agree (A), AND 5= strongly Agree (SA)

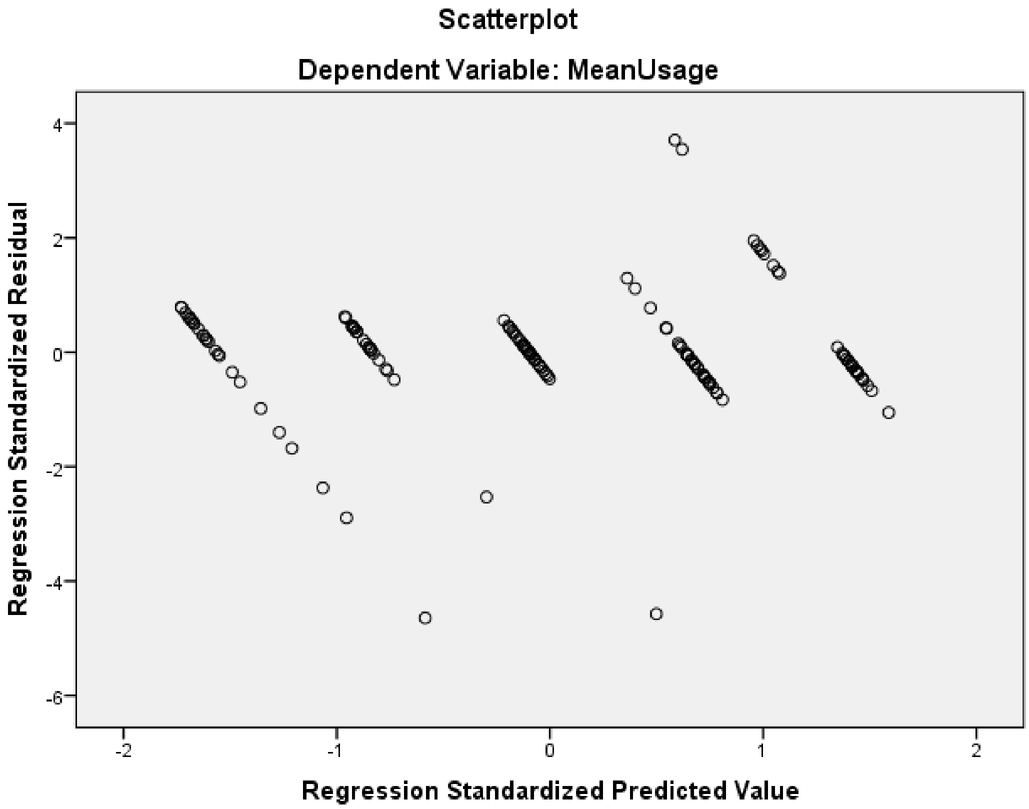
	Items	1 SD	2 D	3 U	4 A	5 SA
67.	There is high efficient Use of CAD-CAM technology					
68.	CAD-CAM technology is Use Frequently					

Thank you for your cooperation

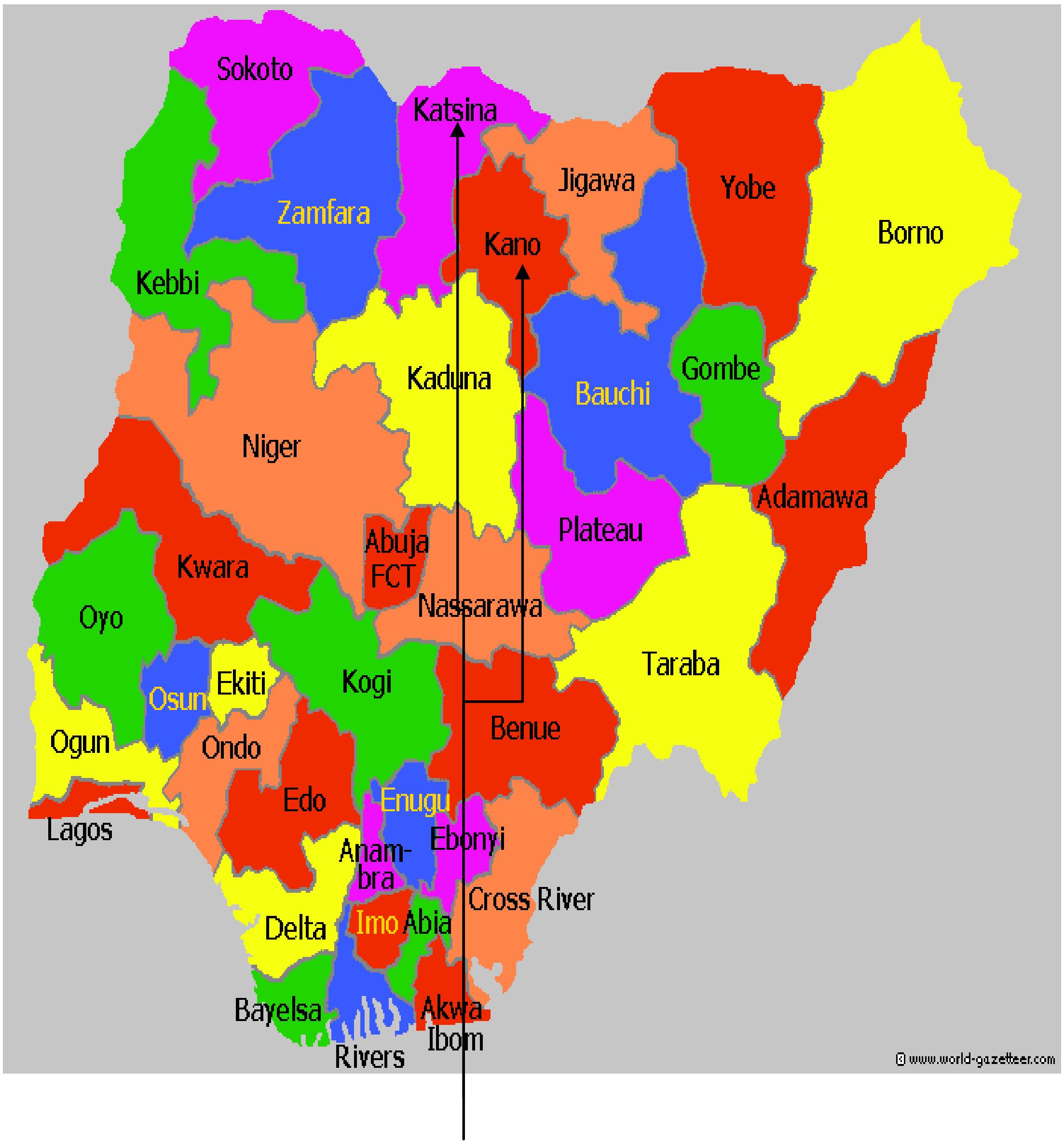
APPENDIX D: Homoscedity Test Graphs






Scatterplot
Dependent Variable: MeanUsage
Regression Standardized Residual
4
2
0
-2
-4
-6
-2
-1
0
1
2
Regression Standardized Predicted Value

APPENDIX E: Map of Nigeria Showing Location of Research Areas



TWO STATES IN NORTHERN NIGERIA

Source: FGN(2015)

APPENDIX F: Distribution of the Study Population in each Industry

s/n	Designers	Technologists	Total No.	%
1	17	25	42	22
2	15	23	38	20
3	13	19	33	17
4	9	13	22	11
5	6	10	16	8
6	4	6	10	5
7	2	3	5	3
8	12	16	28	14
Total	78	116	194	100

APPENDIX G: Sample size of respondents in each textile industries.

s/n	Designers	Technologists	Total No.	%
1	13	19	32	22
2	11	17	28	19
3	10	14	24	17
4	6	10	16	11
5	5	7	12	8
6	3	5	8	6
7	2	2	4	3
8	8	12	20	14
Total	58	86	144	100

APPENDIX H: Response rate

Respondents	Target no. of respondents	No. respondents Achieved	Percentage achieved
Designers	72	55	76.39%
Technologist	86	83	96.51%
CEOs	8	8	100%
Total	152	146	96.01%

APPENDIX I: Reliability Test

Variables	No of Items	Reliability	Remark (Above 0.7 is Reliable)
Competencies of staff in CAD-CAM usage	29	.715	Reliable
CAD-CAM training received and CAD-CAM usage	5	.977	Reliable
Work experience and CAD-CAM usage	1	.700	Reliable
CAD-CAM training on the staff competency	20	.875	Reliable
Overall Reliability	57	.852	Reliable

APPENDIX J: Research Approval Letter from Kenyatta University

KENYATTA UNIVERSITY
GRADUATE SCHOOL

E-mail: dean-graduate@ku.ac.ke

Website: www.ku.ac.ke

P.O. Box 43844, 00100
NAIROBI, KENYA
Tel. 8710901 Ext. 57530

OUR REF: H87F/32376/15

Date: 29th August,2018

The Permanent Secretary,
Federal Ministry of Industry
Trade & Investment,
P.M.B 88 Garki Area 1,
ABUJA, NIGERIA

Dear Sir/Madam,

RE: RESEARCH AUTHORIZATION FOR MR. GAUSA SOLOMON REG. NO. H87F/32376/15

I write to introduce Mr. **Gausa who** is a Postgraduate Student of this University. He is registered for Ph.D. Degree programme in the **Department of Fashion Design & Marketing in the School of Applied Human Sciences**

Mr. Gausa intends to conduct research for a proposal entitled, **"Computer Aided Design and Computer Aided Manufacturing Training, Competency and Usage in Textile Industries of Northern Nigeria".**

Any assistance given will be highly appreciated.

Yours faithfully,

REUBEN MURIUKI
FOR: DEAN, GRADUATE SCHOOL

RM/cao

APPENDIX K: Research Approval Letter from Fed Min of Ind. Trade and Investment

FEDERAL MINISTRY OF INDUSTRY TRADE AND INVESTMENT

INDUSTRIAL DEVELOPMENT DEPARTMENT

OLD FEDERAL SECRETARIAT

GARKI, ABUJA

Ref No: IC.596/IND/I/5

20th September, 2018.

The Director-General,
Nigeria Textile Manufacturers Association,
51, Remi Fani-Kayode Street,
GRA, Ikeja,
Lagos State.

RE: LETTER OF INTRODUCTION

I am directed to introduce Mr Gausa Solomon, a Postgraduate research student of Kenyatta University, Department of Fashion Design and Marketing in the School of Applied Human Sciences with Reg No. H87F/32376/2015, Nairobi, Kenya. Mr Solomon is doing a **"Computer Aided Design and Computer Aided Manufacturing Training, Competency and Usage in Textile Industries of Northern Nigeria".**

2. In this regard, you are implored to introduce him to textile companies operating in Northern Nigeria for data collection in line with his project.

3. Please accept the assurances of the Honourable Minister's warm regards.

Adewale R. Bakare
Director, Industrial Development
for: Honourable Minister.