MODIFICATION OF NIGERIAN TRADITIONAL MEN'S HORIZONTAL LOOM TO ENHANCE PRODUCTIVITY OF THE NARROW BAND FABRIC

A PhD DISSERTATION

BY

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DECLARATION

I, MOHAMMADU YAHAYA WAZIRI with the registration number PhD/ENV-DES/01847/2008-2009, have declared that this PhD dissertation "Modification of Nigerian Traditional Men's Horizontal Loom to Enhance Productivity of the Narrow Band fabric" submitted to the School of Postgraduate Studies, in partial fulfillment of the requirements for the award of the degree of Doctor of Philosophy in Industrial Design was undertaken and written by me.

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CERTIFICATION

This project report dissertation titled MODIFICATION OF NIGERIAN TRADITIONAL MEN'S HORIZONTAL LOOM TO ENHANCE PRODUCTIVITY OF THE NARROW BAND FABRIC, meets the regulations governing the award of the degree of Doctor of Philosophy, in Industrial Design of Ahmadu Bello University, and is approved for its contribution to knowledge and literary presentation.

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D E D I C A T I O N

This dissertation is dedicated to the memories of
my late father Alhaji Waziri Yahaya, my late mother,
Aminatu Waziri and my late first son, Abdulwahab,
May Allah grant them perfect peace, Ameen.

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ABSTRACT

Traditional weavers are faced with more than the usual problems of artists in terms of public exposure and recognition. Very few people who buy hand-woven products have the background to understand the time and effort that was behind the production of their materials. The aim of this study is to revive the traditional men's horizontal loom by constructing a modified loom that will serve as a model for mass production to sustain Nigerian traditional weaving industry and form the basis for experimental research in small scale textile machinery production. The methods used in this study were: field practical and participant observation methods for the construction of the modified loom with the help of carpenters and metal workers who produced the loom parts according to the drawings of the researcher. The main objectives of this study were successful, because the mechanised modified loom constructed can weave. Out of the thirteen samples woven by the researcher, three of the samples march the targeted traditional woven fabrics they are the Sawaye, Zugu and Turkudi woven fabrics. After interviewing all the five groups in this study area all of them did not agree with the first basic assumption which states that the Modified loom products are of a better quality than the Indigenous loom products. Even those who fairly agreed that the modified loom products were stronger than the traditional loom products also agreed that in terms of prestige they too will prefer the traditional loom products. The time spent in the production of the narrow strip turkudi veil and the fact that it is considered a treasured item, the cost of this fabric is not within the reach of the well to do Nigerians not to talk of the poor. When the manufacture of the traditional fabrics is perfected on the modified loom it could compete with the traditional cloth, substitute and even bring down the prices of the traditional fabric if the Chinese methods are followed. The Hausa Turkudi industry, still in active operation in Kura town and its

environs in Nigeria today, is over a thousand years old and represents one of the longest runs of textiles fashion in human history. The traditional horizontal loom fabrics though having value and prestige are going out of extinction because the marketers are already relying on the second hand clothes, referring to them as the best product in the market now. The modified loom would produce a weave equivalent to the works of up to 42 traditional weavers at the same time. The modified traditional men's horizontal loom should not only be motorised, but should be computerized and be a foundation for textile machinery production, if the Indian experience is to be followed for proper industrial development. Our textile technologists should design a programme for textile machine design education facilities which will be strengthened by supporting a postgraduate programme covering textile electronics and loom computer control systems. Government, the textile manufacturers and the association of textile technologists should come together under one roof and invest in research and development (R&D) for the production of indigenous machines that will form the basis of textile machinery manufacture.

Table of Contents

Declaration ---------- i

Approval page---------- ii

Dedication---------- iii

Acknowledgement---------- iv

Abstract---------- vi

Table of Contents---------- vii

List of tables---------- xi

List of Figures---------- xii

List of plates---------- xiv

Definition of operational terms---------- xviii

CHAPTER ONE

1.1 INTRODUCTION ---------- 1

1.2 STATEMENT OF THE PROBLEM---------- 3

1.2 AIM OF THE STUDY---------- 3

1.3 OBJECTIVE OF THE STUDY---------- 3

1.4 RESEARCH QUESTIONS---------- 4

1.5 BASIC ASSUMPTIONS---------- 5

1.6 SIGNIFICANCE OF THE STUDY---------- 5

1.7 JUSTIFICATION OF THE STUDY ---------- 7

1.8 SCOPE AND DELIMITATION TO THE MODIFICATION OF THE TRADITIONAL MEN'S HORIZONTAL LOOM---------- 7

CHAPTER TWO

REVIEW OF RELATED LITERATURE---------- 9

2.1 INTRODUCTION---------- 9

2.2 THE CONCEPT OF WEAVING---------- 8

2.3 LOOMS AND THEIR IMPORTANCE---------- 10

2.4 TYPE OF LOOMS---------- 11

2.4.1 The Men's Traditional Narrow Horizontal Loom ———————————— 14

2.4.2 The Chadic Loom---------- 15

2.4.3 The Hausa looms---------- 18

2.5 FUNCTIONS OF THE LOOM---------- 21

2.6 MATERIALS FOR LOOM CONSTRUCTION IN TEXTILE DESIGN STUDIO ---------- 22

2.7 QUALITY OF IDEAL STUDIO BASED LOOM ---------- 22

2.8 THE NEED FOR MODIFICATION OF THE LOOM CURRENTLY IN USE---------- 23

CHAPTER THREE

METHODOLOGY ---------- 30

3.1 INTRODUCTION ---------- 30

3.2 METHODOLOGY ---------- 30

3.3 PILOT STUDY---------- 31

3.4 RESEARCH DESIGN---------- 38

3.4.1 Problem-Solving Research---------- 38

3.5 POPULATION OF THE STUDY---------- 39

3.6 SAMPLE OF THE STUDY---------- 40

3.6.1 Sampling techniques of the study---------- 40

3.7 INSTRUMENTS FOR DATA COLLECTION---------- 41

3.7.1 Data Collection---------- 41

3.8 RESEARCH ACTIVITIES---------- 42

3.8.1 Construction of the Modified Loom---------- 47

3.9 MODIFICATION OF THE HORIZONTAL LOOM---------- 55

3.10 THE PLAIN WEAVE DESIGN---------- 64

3.11 DATA PRESENTATION AND ANALYSIS---------- 69

CHAPTER FOUR

RESULTS AND DISCUSSIONS---------- 70

4.1 INTRODUCTION ---------- 70

4.2 WEAVING SAMPLES WITH THE MODIFIED LOOM---------- 71

4.3 LIMITATIONS OF THE STUDY---------- 89

4.4 PRODUCTS OF THE MODIFIED AND UNMODIFIED TRADITIONAL LOOMS---------- 90

4.5 SUMMARY OF THE PRACTICAL WEAVING PROCESSES---------- 92

4.6 DATA COLLECTION ON THE WOVEN SAMPLES---------- 93

4.6.1 Summary of Data Collection and Treatment---------- 99

4.6 DISCUSSION---------- 113

4.6.1 Stereotype of the Woven Traditional Fabric---------- 115

4.7 DEVELOPMENT OF THE WEAVING LOOM---------- 123

4.7.1 Standardization of Parts to Reduce Costs---------- 127

4.8 RESEARCH AND DEVELOPMENT---------- 135

4.8.1 Development of the Weaving Loom in India---------- 137

4.9 SUMMARY OF THE FIRST BASIC ASSUMPTION OR THE HYPOTHESIS 0, REJECTED BY THE STUDY---------- 142

4.10 SUMMARY OF THE SECOND BASIC ASSUMPTION OR THE ALTERNATIVE HYPOTHESIS 1, ACCEPTED BY THE STUDY--- 143

4.11 SUMMARY OF THE FIRST BASIC ASSUMPTION OR THE HYPOTHESIS 0, REJECTED BY THE STUDY AND THE ALTERNATIVE HYPOTHESIS 1, ACCEPTED BY THE STUDY--- 145

CHAPTER FIVE

CONCLUSION AND RECOMMENDATIONS---------- 148

5.1 CONCLUSION---------- 148

5.2 RECOMMENDATIONS---------- 149

REFERRENCES---------- 151

APPENDICES---------- 156

LIST OF TABLES

Table 4.1 Summary of those interviewed---------- 99

Table 4.2 Level of Western education of the respondents---------- 100

Table 4.3 Attainment of Islamic education of the respondents ---------- 101

Table 4.4 Inheritance- or otherwise of the people interviewed in the Various groups under study---------- 101

Table 4.5 Summary of the ages of those interviewed in the study---------- 102

Table 4.6 Hypothesis 0 the modified loom products are of better Quality than the indigenous loom products---------- 103

Table 4.7 Hypothesis 1 the modified loom products are of better Quality than the indigenous loom products---------- 104

LIST OF FIGURES

Figure 2.1 Nigerian map showing areas of hand weaving---------- 16

Figure 4.1 Cluster sampling chart of the summary of the Levels of Western Education of the respondents---------- 105

Figure 4.2 Cluster sampling chart of the summary of the Attainment of Islamic Education of the respondent---------- 106

Figure 4.3 Cluster sampling chart of the Ages of weavers interviewed in the study---------- 107

Figure 4.4 Cluster sampling chart of the ages of dyers interviewed in the study---------- 108

Figure 4.5 Cluster sampling chart of the ages of calenderers interviewed in the study---------- 109

Figure 4.6 Cluster sampling chart of the ages of marketers interviewed in the study---------- 110

Figure 4.7 Cluster sampling chart of the ages of users interviewed in the study---------- 111

Figure 4.8 Summary of the first basic assumption or hypothesis 0 accepted by the study---------- 143

Figure 4.9 Summary of the second basic assumption or Alternative hypothesis 0 accepted by the study---------- 144

Figure 4.10 Summary of the first basic assumption and

second basic assumption or the null hypothesis 0

rejected and the alternative hypothesis 1

accepted by the study---------- 145

LIST OF PLATES

Plate 2.1 Narrow strip fabric---------- 16 Plate 2.2

Pedals attached to the ground by ropes---------- 17

Plate 2.3 Leclerc Weavebird Computer Floorloom---------- 25

Plate 2.4 Computer Design Controller---------- 25

Plate 2.5 Opening of the Shed---------- 26

Plate 2.6 Shuttle-less Loom---------- 27

Plate 2.7 Booria Loom Controller---------- 28

Plate 2.8 Designers Pad for the Loom Controller---------- 29

Plate 3.1 Cotton Fibres---------- 32

Plate 3.2 Spools of Hand Spun Yarns---------- 33

Plate 3.3 the Heddles of the Turkudi Loom---------- 34

Plate 3.4 Reed or Comb of the Turkudi Loom---------- 35 Plate 3.5

Product of the Zugu loom---------- 36

Plate 3.6 Product of the Turkudi loom 1---------- 36

Plate 3.7 Product of the Turkudi Loom 2---------- 36

Plate 3.8 Clothes woven on the traditional narrow horizontal looms---------- 37

Plate 3.9 Wooden lower frames of the modified loom---------- 49

Plate 3.10 Assembling the lower frame of the modified loom---------- 50

Plate 3.11 Metallic and wooden parts ---------- 51

Plate 3.12 Wooden accessories ---------- 52

Plate 3.13 Assembling the lower frame of the modified loom---------- 53

Plate 3.14 Assembling the modified loom continues---------- 54

The beater in plate 3.15 was modified to the beater in plate 3.16---------- 55

Plate 3.17 Heddles modification to heddles Plate 3.18---------- 55

Plate 3.19 Pedals modification to the pedals in Plate 3.20---------- 56

Plate 3.21 Drag weight modification Warp beam to Plate 3.22---------- 56

Plate 3.23 Single pole modification to Heddles pulleys Plate 3.24---------- 52

Plate 3.25 Horizontal loom to modified loom on Plate 3.26---------- 57

Plate 3.27 Horizontal loom Shed to modified loom shed Plate 3.28---------- 58

Plate 3.29 Warping to form a shade on the warp frame---------- 58

Plate 3.30 Warping on the warp frame---------- 54

Plate 3.31 Beaming the modified loom---------- 60

Plate 3.32 Beaming the modified loom continues---------- 61

Plate 3.33 Threading the Warp Yarns---------- 62

Plate 4.1 Heading the Loom ---------- 73

Plate 4.2 Weaving with the Modified Loom---------- 74

Plate 4.3 First Fabric Woven on Modified Loom ---------- 75

Plate 4.4 Second Weave with the Modified Loom---------- 76

Plate 4.5 Third Weave with the Modified Loom---------- 77

Plate 4.6 Fourth weave with modified loom---------- 79

Plate 4.7 Fifth Weave Design with the Modified Loom---------- 80

Plate 4.8 Sixth Weave with Modified Loom---------- 81

Plate 4.9 Changing the Heddle Strings---------- 82

Plate 4.10 Fabric Woven on Warp Same as Weft---------- 83

Plate 4.11 Broken Warp Yarns were Replaced---------- 84

Plate 4.12 Zugu Traditional Fabric Imitation---------- 85

Plate 4.13 Turkudi Loom Imitation Weave---------- 86

Plate4.14 Turkudi Cloth Weave-Imitation on the Loom---------- 87 Plate 4.15 100% Polyester Yarns used as Warp Yarn---------- 88

Plate 4.16 Balls Formed on the Warps at the Back of the Loom---------- 89

Plate 4.17 Product of the Modified Loom---------- 91

Plate 4.18 Traditional Sawaye Cloth---------- 91

Plate 4.19 Product of the Modified Loom---------- 91

Plate 4.20 Traditional Zugu Cloth---------- 91

Plate 4.21 Traditional Turkudi Cloth---------- 92

Plate 4.22 Product of the Modified Loom---------- 92

Plate 4.23 Researcher with Turkudi Loom Weaver---------- 94

Plate 4.24 Kura Turkudi Market Dealers with the Researcher---------- 95

Plate 4.25 Researcher with Kura Hand Spindle and Chalk Dealers---------- 96

Plate 4.26 Researcher with Kura Indigo Pit Dyers---------- 97

Plate 4.27 Researcher with Kura Calenderers of Indigo Blue Turkudi Veils-- 98

Plate 4.28 Traditional Turkudi Veil---------- 115

Plate 4.29 Products of the Modified Loom---------- 115

Plate 4.30 New Emir of Kano Mohammadu Sanusi Holding his Court Session at Governor's House Kano ---------- 116

Plate 4.31 Tuareg Men Wearing Indigo Blue Turkudi Veils---------- 117

Plate 4.32 Tuareg Women Wearing Indigo Blue Turkudi Head Gears---------- 118

Plate 4.33 Fulani Girls Wearing Hand Woven Head Gears---------- 119

Plate 4.34 Young Fulani men---------- 120

Plate 4.35 Rolls of Strips Cotton Cloth---------- 121

Plate 4.36 Woven Kente Cloth---------- 122

Plate 4.37 Original Jacquard Loom---------- 125

Plate 4.38 Standardized Parts of a Loom---------- 129

Plate 4.39 Weave-bird---------- 130

Plate 4.40 Loom Controller---------- 131

Plate 4.41 Leclerc Loom Stores---------- 132

Plate 4.42 Semi-automatic Loom---------- 138

Plate 4.43 Automatic Weaving Loom---------- 141

Definition of operational terms

Abawa	-	Hausa word for weft threads
Bullam	-	Fulani word for horizontal loom woven cloth
Dandogo	-	Yoruba traditional dress
Fali	-	An ethnic group in Adamawa state and in Cameroun
Gabaga	-	Fali word for hand woven cloth
Gbariye	-	Yoruba traditional dress (smock)
Langtang	-	Mumuye word for woven cloth
Riga	-	Hausa word for gown
Shegga	-	Tuareg word for turban
Tipeshu	-	Apron with blue and white hand woven cloth
Tuareg	-	Another name for the Berbers
Wadari	-	Hausa word for warping
Wendy	-	Kanuri word for woven cloth regarded as money
Zare	-	Hausa word for warp threads

CHAPTER ONE

INTRODUCTION

1.1 INTRODUCTION

Nigeria is located between the Lake Chad and the Niger Delta, with thick tropical forests in the south and far ranging grasslands in the north. Nigerians are dynamic people with troubled history, during which great kingdoms were formed. The kingdoms were composed of diverse people and cultures. The people came into contacts with advanced cultures from the earliest times by way of trade from the Sudan in the north. These advanced cultures were readily accepted and integrated. Every culture, according to Collingwood (1981) "had its own special textiles – recognizable and distinct from all others, some functional, some ceremonial, and some simply woven, some amazingly complex."

Weaving according to Joseph (1980) "is one of the oldest arts known….though no actual looms from early civilizations survived, fabrics of fine quality have been found in the tombs of ancient Egypt and designs on very old pottery provide indisputable evidence of early skills in weaving." According to Broudy (1979), "the loom was treated only incidentally- usually in a 'how to weave' context, rarely historical. I learned that, in general, writers on weaving concerned themselves primarily with textiles, drafts, yarns, colours and patterns and discussed looms only as much as was necessary to describe how to tie on a pattern."

Traditional weavers are faced with more than the usual problems of artists in terms of public exposure and recognition. Very few people who buy hand-woven products have the background to understand the time and effort that was behind the production

of their materials. The art of traditional cloth and cloth making in Nigeria have been separated from its industrial progress. Traditional weaving has less attention being paid when it comes to adaptation to suit Nigerian market needs. Traditional weaving is still revered, preserving the old ways, which is culturally and historically important, but it has little to do with the economic development of the country, which needs improvement.

According to Lamb and Holmes (1980) "It is a fact that, on the whole, the ethnographers of the colonial period were not very interested in cloth and cloth making… while post colonial students of Nigeria material culture, have tended to look more at the art of the dyer than the weaver." In many parts of Nigeria traditional weaving is fast disappearing, unable to face the competition of factory made cloth. As stated by Lamb and Holmes (1980) "we hope that our work, presented in this book may be of some help in preserving the memory of weavers confronted with this distressing fate."

According to Mehta (1985) "the rapid growth of the textile industry in India in the first of this century was largely due to the "Swadeshi Movement" inspired by Mahatma Gandhi, which stressed the importance of self-reliance. There has been a considerable boost in activity in the textile machinery, having imbibed all types of technologies from almost all the developed countries." The traditional weaver spends much time in producing a piece of material, so the price of his product does not compensate with the time spent in the production, and that keeps him out of the market.

1.2 STATEMENT OF THE PROBLEM

There are many schools of thought about Nigeria's technological development. Some believe in constant importation of foreign technology since the nation is still developing, others want development from the grassroots level; and some want the adaptation of the foreign technology to suit the Nigerian situation. Adetoro (1980) feels that development from the grassroots level is more adequate. He said "what is, important is for the present Nigeria textiles producers to translate the mechanics of the traditional looms to contemporary types."

According to Dutsenwai (2009) "the indigenous Hausa technology of textiles production and services such as indigenous hand spinning, weaving and indigo dyeing have been fatally influenced by modern technology."

The problem of this study therefore is to the construct a modified loom model that can be replicated to enhance productivity of the traditional men's horizontal loom in the weaving of the narrow band fabric.

1.3 AIM OF THE STUDY

The aim of this study is to revive traditional men's horizontal loom through the development of the modified loom model that can enhance productivity in the weaving of the narrow strip fabric.

1.4 OBJECTIVES OF THE STUDY

The objectives of this study are to:

1. Modify and construct a men's horizontal loom that will serve as a model for mass production to sustain Nigerian traditional weaving industry.
2. Produce a loom that can weave in strips form, multiplying the works of many traditional weavers at the same time.
3. Construct a loom that can encourage narrow strip traditional cloth weaving that can enhance productivity.
4. Produce a fabric that can be acceptable to the users and marketers of traditional narrow strip Nigerian woven dress.
5. Produce a modified traditional loom that could be the basis for experimental research in small scale textile machinery production.

1.5 RESEARCH QUESTIONS

The following were the research questions issued as guide to the study.

1. What is the productive structure of the existing Nigerian men's traditional horizontal loom?
2. Can the traditional horizontal loom be structurally modified to enhance its production capacity?
3. Could the production output of the modified loom replace the works of the already disappearing narrow-strip weaving craftsmen?
4. Could the products of the modified loom be acceptable to the users of the narrow strip traditional dress?

1.6 BASIC ASSUMPTIONS

The assumptions of this study are that the Nigerian men's traditional horizontal loom is effective in terms of narrow strip weaving. This weaving industry should therefore be revived in terms of production quality and quantity;

1. The modified loom model could produce better quality fabric than the narrow horizontal traditional loom.

2. The narrow horizontal loom products are of better quality than the products of the modified loom products.

3. The narrow horizontal traditional loom could be replaced by the modified loom.

4. The narrow strip traditional fabric could flourish once again in our markets.

5. The modified loom products could be accepted as the narrow strip traditional fabrics.

1.7 SIGNIFICANCE OF THE STUDY

Traditional weaving is historically, one of the greatest contributions of Nigeria to the textiles crafts of the world. Unfortunately traditional weaving industry in Nigeria is disappearing without replacement in the area of improving the Nigerian traditional woven fabric. The traditional loom should be modified and improved in terms of capacity and production output. Many nations do invest in research work and encourage the use of local materials, the result of which became useful at the time of emergency. The production of the modified loom and data collection of this study has great potentials to develop concepts and insights into the learning phenomenon in the visual arts and enhance industrial production.

The modified loom can be used as teaching aid by educational institutions where weaving is offered as a course. According to Ada (1985) “Most Nigerian institutions of higher learning where weaving were being run as an academic course, depends extensively on the use of imported materials, including the looms.” He went on to add, “Individuals and organizations who would have loved to include the contemporary institutionalized type of weaving in their programmes are still largely held back due to the shortage of looms.” The construction of the modified loom and the data collection on this study has great potentials in developing the institutionalized type of training in the weaving craft.

The socio-cultural significance of this study is the product of the modified loom which is dress fabric. According to Maiwada (2008) “dress is an important component of our daily lives. Through clothing, individuals establish their sense of self as well as their place in society.” He went on to say that, “our leaders for instance, both traditional and political, use dresses as a symbol of power and charisma. The traditional rulers put on large, costly and heavily embroidered robes along with turbans especially in the Muslim dominated areas. This obviously makes them look huge, flamboyant and elegant. As such their subjects look at them enviously and sometimes fearfully.” So they are upheld as a source of authority. Another aspect of this study that will help socio-culturally is the training of youth and the revival of the production of the disappearing traditional narrow strip fabric weaving.

The economic significance of this study is the transformation of the traditional men’s narrow horizontal loom from traditional to a modified mechanised loom which could be organized into industrially based small scale textiles centres. Lamb and Holmes (1980) stated that “many of the rural weavers whom we have encountered in Hausa land were old men. Every where we were told of the reluctance of boys to learn the

craft, which has to compete in attraction with the opportunities offered by the fantastic economic development of Northern Nigeria in recent years." With the increase in production output of the modified loom, youth will be encouraged to participate fully in the craft. The products of the modified loom could be used locally and could even be exported conveying traditional Nigerian designs which will serve a useful economic purpose for the nation.

The technological and industrial significance of this study is that the modified loom could be the basis of establishing an industrial and technological research institute for the development of textile machinery. Abbes (1965) expressed that, "although not all hand-weaving have contributed to industrial textiles, it was through the stimulating influence of the hand-weaving that the industry was becoming aware of new textiles possibilities."

1.8 JUSTIFICATION OF THE STUDY

This research programme was undertaken as a result of calls and recommendations by some researchers who unanimously agreed that research on indigenous small scale handcrafted textiles would enhance and change their status from traditional to modern small scale textiles centres these researchers include Adetoro (1980), Ada (1985) and Dutsenwai (1985). Some research studies were conducted on the indigenous textiles like the studies of Renne (2002), Gillow (2003) and Dutsenwai (2009) but none was specifically focused on the traditional horizontal loom, the works of Shea (1979) and Ada (1985) were well noted.

The following were the justifications of the study:

1. The modified traditional horizontal loom will serve as instructional materials for

teaching and learning.

2. It will also serve as an efficient machine for mass production and a source of income.
3. It will also serve as means of reducing the level of unemployment as faced by the Nation.
4. The study when concluded will pave ways of the renaissance of the dead textile industry in Nigeria.

1.8 SCOPE AND DELIMITATION TO THE MODIFICATION OF THE TRADITIONAL MEN'S HORIZONTAL LOOM.

The production of the modified traditional men's horizontal loom serves as a model for replication to sustainable narrow strip fabric production. The scope of this study therefore is Kura Local Government Area in Kano State. The study has been delimitated to Kura town in Kano State. The reason for selecting Kura town as the study area is because it is a centre for indigo dyeing and traditional weaving. Almost all the traditional men's horizontal looms can be found there.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

2.1 INTRODUCTION

The term weaving refers to the interlacing of warp and weft yarns at established sequences. The longitudinal yarns are called the warp. The interlacing yarns are called the weft yarns. The apparatus which provides the interlacing of both the warp and the weft yarns is called the loom. According to Joseph (1980) "Weaving is one of the oldest known arts…..though no actual looms from early civilizations survived, fabrics of fine quality have been found in the tombs of ancient Egypt, and designs on very old pottery provide indisputable evidence of early skills in weaving."

2.2 THE CONCEPT OF WEAVING

According to Joseph (1980), "early looms were very crude compared to modern mechanical weaving contrivances. Nonetheless, all looms, old and new alike, have a few basic principles in common. There is a system to hold the warp yarns under tension, there is a way to spread yarns apart so that the crosswise threads can move through the opening or shed, and there is a device to pack the crosswise threads tightly together." Sandstrom (1982) also stated, "In weaving there are two yarn systems crossing each other at 90^0 angles and interlaced in some orderly fashions." She further stated that, "the lengthwise yarns in the fabric are called 'warp' ends and the widthwise yarns are referred to as 'filling' or 'picks'. The order by which these

yarns are interlaced is called the ‘weave’ and the means by which they are combined is called a ‘loom’.”

Stout (1970) also stated that, “the machine for weaving is a loom, of which there are several types varying in complexity. All looms, from the most primitive to the most modern, operate on similar principles”. Nkeonye (2009) stated that “weaving is the interlacing of warp and weft threads on a loom to form a fabric”. He went on to say that, “The operation of weaving may be summarized as a repetition of the following sequence of actions:

i. **Shedding:** The warp threads are separated by rising and lowering the heald frames (or harness) to form an opening called a shed, through which the shuttle can pass.
ii. **Picking:** The shuttle, carrying the weft is propelled across the loom, through the shed.
iii. **Beating-up:** The inserted weft yarn is pushed forward against the fell of the cloth by the reed.” He summarized the three actions in basic weaving as the “primary loom motions.”

2.3 LOOMS AND THEIR IMPORTANCE

According to Adetoro (1980), “It is a fact that anybody who has a loom and yarns and who understands the techniques of weaving can execute a woven fabric, but the question is what type of fabric and for what society is it made?” For those who believe in constant importation of foreign materials, there is the danger of importing materials that do not suit the environment of the country which imported it. Adetoro (1980) stated that, “what one finds are different types of textiles goods that are not

reflecting the cultural aspirations of our people." The products would be available but not satisfying the taste of the consumer in terms of quality in both materials and designs.

Maiwada (2008) stated that, "scholars of modern time believe that dress provides a mark of identity and through which non verbal messages are communicated. It is also believed that in traditional societies, dress functions almost as a language that can indicate a person's age, gender and marital status, place of origin, religion and social status."

According to Joseph (1980), "in the late 1700s and early 1800s scientists and inventors such as Joseph Marie Jacquard and Edmund Cartwright developed weaving looms that were partially machine powered. Later, manufacturers produced looms that were entirely mechanical and power-driven." Nigeria has a tradition in cloth making and decoration which was of great importance to its West African neighbours long before the first Europeans made contact with the shores of West Africa. The traditional weaving craft has given Nigeria a place in the Textiles Museums of the world.

2.4 TYPES OF LOOMS

Brostaff (1978) stated that, "in the 18th century over 180,000 hand-weavers were in their private shops in Birmingham, England producing fabrics." She added that; "with many people thinking about and being occupied in the weaving, there were bound to be some inventive minds concerned with finding ways to relieve the exhaustive work and improve the weaving process".

Broudy (1979) also stated that, “the introduction of flying shuttle loom by John Kay in 1773 brought a great innovation in weaving technology. John Kay lived from 1704 until about 1774 and died in poverty. Modifications of his inventions are still in use to this day. But most of his and his son’s innovations were initially rejected by the weaving industry. Hand weavers burnt Kay’s living headquarters and destroyed his inventions as, “very dangerous pieces of furniture.”

The first attempt of figure weaving, according to The New Encyclopedia of Textiles (1980), was the ancient draw loom. It has been in use in France and Holland since the fifteenth century. Rothstein (1977), states that, “the draw loom was an indigenous device of cord, wood and lead weights. The warp is entered through the figure harness through the heddles on the shafts to produce the woven fabric.”

According to Grociski (1975), “the drawloom was slow to set up; changing the pattern took a very long time. To operate the loom required not only a weaver, but also a drawboy to open the shed by pulling the cords for each line of the design. It became apparent that the drawloom would not be able to supply all of the demands for figured materials, and that some mechanical means would have to be devised to meet these demands”. He then added that, “the famous Jacquard loom had the answer to these early day difficulties. Joseph-Marie Jacquard (Appendix III) in 1801, in Lyons, France, invented a special mechanism, situated over a hand or power loom, for opening the shed via cards; it is called a Jacquard head-motion”. This is not to say that the Jacquard machine was accepted without resistance.

According to Gilroy (1844), “like many other great inventions, the progress of this machine was not near so rapid as it merit, might have led us to suppose” when he was referring to the Jacquard head-motion. He gave the reasons for the slow progress of the machine, “the first of which was the opposition by weavers who feared that they

might be thrown out of their jobs; the second was the imperfection of some of the machine movements." Rothstein (1977), also reported that, "the Jacquard machine should have come into immediate use but so many were its advantages. In fact, it took at least ten years before the loom was accepted commercially in Lyon." She further added that, 35 years after the Jacquard's Paris exhibition of 1801, even Britain, which was regarded as the home of industrial revolution, found it difficult to accept this useful invention, Appendix IV.

Rothstein (1977) gave as reasons for the delay, apart from the technical considerations, the fashion of the time. At no time in the century before or the nearly two hundred years since, that time, have the materials for fashionable dress been as plain as in the decade from 1800 to 1810." She added that, "the use of the Jacquard had decline for the profit was the same as the common engine, when the expenses of the Jacquard, in terms of designing and card cutting, is taken in account."

Adrosko (1983) stated that, "the idea of using a series of corresponding pegs and holes to operate mechanical devices has been applied earlier to musical boxes and automata." She holds the view that, "Joseph Marie Jacquard's contribution was to combine all of his predecessors' ideas into a practical machine."

The view of Rothstein (1977) can be upheld, when she further stated that, "of all the writers, nineteenth century or modern, only Gilroy (1844), was honest about the story of the Jacquard." The researcher disagrees with Rothstein for not accepting Gilroy's first reason for the slow acceptance of the Jacquard, when she attributed it to the opposition of the weavers. Rothstein opposed this by saying that, it was power loom which were smashed by Luddities, not Jacquards; the later were admired by both masters and men." Although the Jacquards were admired by both weavers and manufacturers, the researcher finds that Gilroy had justification in his claim.

According to Mulkey (1956), “the introduction of this loom caused wide-spread unemployment. It was estimated that one machine took the place of 100 weavers. Riots resulted in many textile centres.”

According to Ada (1985) “Records have shown that the drawloom, Dobby and Jacquard looms all trace their origin to the hand-weaving looms”. He went on to add that, “with the proper integration of the hand-weaving techniques and their thorough development in Nigeria, a better and improved technical development in fabrics-by-hand production could be accomplished. Some of the cultural wealth already known in our people would still be preserved.”

2.4.1 The Men’s Traditional Narrow Horizontal Loom

The horizontal loom in Nigeria, according to Lamb and Holmes (1980), used by men most probably has a northern origin. There is evidence to suggest that cotton spread westward from Nubia on the upper Nile somewhere around the beginning of the Christian era if not earlier, and cotton became associated in sub-Saharan West Africa trade, with the demand for cloth by the desert normads and by the ability of the peoples living along the Southern edge of the desert to produce the required fabrics. They went on to add that, “In the fourteenth century we know the rolls or strips of cotton cloth were being used as currency in Borno, (see Plate 2.1) and by that time the trade link between the weavers and the dyers of the Kano region and the Tuareg and other nomards of the Sahara had been well established.”



Plate 2.1: The narrow strip fabric

Source: Photographed by M. Y. Waziri (2012)

Lamb and Holmes (1980) also stated that, "There was a serious change in the structures of the internal politics of what was to become Nigeria as a result of the establishment of the Fulani Empire. The influence of the Fulani Emirs on the evolution of Nigeria even in regions which never come under their direct influence was indeed profound." They added that, "it is only necessary to observe that this great revolution centered on northern Nigeria, but with an impact over a few wide region it served to spread fashion in cloth and to influence on others. The traditional Yoruba dress, for example, is still influenced by the legacy of the emirs and their retainers mounted so glorious on horseback. The Yoruba gowns and smocks, 'dandogo' and 'gbariye' still retain the pair of opening through which their wearers could hold their horses' reins. This feature which now serves only as the opening of pockets can be seen even in garments intended for very young boys".

2.4.2 The Chadic Loom

According to Lamb and Holmes (1980), "the different users of the Chadic loom include the Kanuri, the Kotoko, and Bagirmi group, the Njagi, Margi, Kilba, Fali and Bata many of whom have intermixed with the local Fulbe and Waja groups. The loom

is still in use in the northeastern Adamawa State from Yola through Zummo, to Mubi with their counterparts in Cameroun. The general zone of the West African and Chadic looms include: northeastern Nigeria, northern Cameroun and southeast Chad ". See Figure 2.1.



Figure 2.1: Nigerian map showing areas of hand weaving

Source: Lamb and Holmes (1980)

There are three main features which distinguishes the loom from the neighbouring Hausa loom. First, instead of the single pole, the Chadic loom employs a frame which includes two longitudinal top members across which are hung on a cross-bar, the beater and heddles. The cross-bar is not tied to the frame but is free to move along the

longitudinal members very much in the manner of framed looms in other parts of West Africa. See Appendix V.

Those of the Asante and Ewe in Ghana are examples of some basic structures also this loom employs a beater with heavy wooden bowls quite distinct from the leather bound beaters of the Hausa or the wooden beaters of Nupe and Yoruba. Again, parallels can be drawn with beaters from many weaving groups in the West of Nigeria, those of the Baule in the Corte de Voire perhaps being particularly close to the Chadic type. Furthermore, these looms use wooden heddle pulleys of quite distinctive form. Some resemble the Nupe shape. Others like those of the Waja are almost specific to that group only. See Appendix VI.

The Chadic loom is used in the production of very narrow strips, usually two inches (5cm) or less, which in turn implies light drag weights. The normal drag weight is carried either in an old enameled plate or bowl, in the manner of the Turkudi loom, by the Hausa people or on a piece of matting or basket work made especially for this purpose. The weaver sits in a more or less upright posture on a seat. His pedals are not attached to the ground by ropes as in Plate 2.2 but rest at one end on the ground and drive their



Plate 2.2: Pedals attached to the ground by ropes.

Source: Photographed by M. Y. Waziri 2012

movement from pressure against a fulcrum provided by a stick or stone. See Appendix VII.

This type of loom produces one-inch (2.5cm) strip woven from a cotton yarn so fine and soft that it could well have been silk, for ceremonial use. The pure white of this fine cloth (bullam) has long had a special appeal to the Fulani aristocracy. The other peoples of Adamawa have also placed great importance on bullam cloth. The Fali for example, both in Nigeria and across the border in Cameroun, use bullam strip as part of a dowry, and their men wear garments based on this material, a rectangular apron tipeshu with a few blue or blue and white strips intermixed with the plain white, and decorated with embroidery using geometric shapes, and also a large white cloth either worn formally, Toga fashion (with the right shoulder bare), or draped casually over the left shoulder.

According to Lamb and Holmes (1980), "The same Fali use narrow white strip, either gabaga or bullam, to bind up the bodies of their dead; Gauthier and Jansen (1969) have published a most striking photograph of such a corpse looking very much like an Egyptian mummy but fixed in an upright seated posture with the arms stretched forward". They went on to add that this practice, alone, would suffice to maintain some demand for the narrow gabaga or bullam strip woven along this northern stretch of the Nigeria-Cameroun border. See map of Nigeria in Figure 2.1.

2.4.3 The Hausa looms

According to Lamb and Holmes (1980), "starting at a point to the south of Zaria and Kaduna, the border would run northeastward to include Ningi and Potiskum, and then turn north to the Nigeria - Niger border north of Hadeja; the line would then run westwards along the international border to a point northwest of Sokoto. Then it would return Southeast

wards to its starting point in the general Kaduna-Zaria region, taking in on its way the town of Kebbi. Within this great area roughly triangular in shape, we can find, at least in so far as men's weaving is concerned, a Hausa heartland." See map of Nigeria in Figure 2.1.

Lamb and Holmes (1980) added that there are five main categories of looms in Hausa land:-

The extremely narrow Turkudi loom

The Zugu and Sawaye looms

The Mudukare loom

The Luru blanket loom

The very wide Chakerikeri loom

These five major categories of all possess certain common features which serve to distinguish them from other looms" The most easily recognized feature is the use of a single pole located directly behind the weaver to support heddles and beater. The pole can be in a Hausa loom set within a house, because the heddles and the beater can be supported by a cord attached to the wall behind and above the weavers head. See Appendix VIII.

Another general Hausa feature is the method of attaching the breast beam by means of a pair of ropes attached to the pegs in the ground located behind the weaver. Hausa loom has short side pedals attached to the shafts. The pedals are attached to the ground by means of cords fixed either to the warp beam supports or to pegs in the ground. Lamb and Holmes (1980) went on to add that, "Hausa looms have the oldest and most characteristic form of apparatus for enabling the two heddles to oscillate as a rocker or horse, rather than a pulley. Many Hausa looms do make use of pulleys, generally of metal with a nut wheel". See Appendix IX.

Hausa warping up, 'Wadari' involves two basic methods, one of the methods with the warps laid out on the ground (See Appendix X) and one with the warps strung up along walls, fences and even hedgerows. See Appendix XI.

Lamb and Holmes (1980) stated that, "The Hausa weaving complex, in other words, spans the totality of Hausa life, from the remote farm to the environs of the Emirs Palace". They went on to say that weaving can also be found, "from a settled town house (as, for example Zaria) to temporary groupings of migrant weavers under grooves of trees on the countryside convenient to some markets". They went on to add that, "Hausa made weaving was very much on the decline, kept alive by certain highly specialized traditional uses such as the demand for white Sawaye cloth for burial shrouds and other cloth still sought after by the Saharan nomads." The Sawaye cloth is woven on a strip rather wider than Zugu, between three (7.5cm) and five inches (12.5cm). It is a general purpose material found throughout the Hausa Heartland and their neighbours. With hand spun yarn, two types of thread are used: Zare for warp, with a tighter and stronger spin and using rather more cotton; abawa for weft thicker but more loosely spun. On warp width of three and half inches (8.75cm) there are usually some 76 warp yarns and a weft pick of 20 to the inch (2.5cm).The weave is rough and loose when woven, but compacts considerably after washing to become a fabric capable of very hardware.

The warp yarns are known individually as 'ends' and the term 'picks' or filling' are applied to the weft yarn. From the point of view of the designer the complicated operation of a weaving machine or loom can be broken down into simple functions related to the process of cloth formation with particular reference to those functions which have greatest influence upon the structure and appearance of fabrics. The weaving process itself consists of three basic operations which form a continuous cycle whether in simple hand loom or in the most complex automatic machine. These primary motions are the shed, the pick and the beating up.

1. The shedding is the separation of the warp yarns into upper and lower layers forming a 'shed' or an opening through which the weft yarns were passed.

2. The picking is the insertion of the weft yarn through the shed.

3. The beating up is the carrying forward of the last inserted pick of the weft to the cloth on the beam already woven.

The picking and beating up operations are fixed no matter what type of fabric is being produced or what type of loom is used, but the shedding motion is variable and can be described as the heart of weaving. The unit of woven fabric is the point of insertion of a warp end and weft pick, the interlacing can be done in two possible ways. A number of these interlacing combined together in both directions produce a unit of design. The simplest weave which can constitute a cloth requires two ends and two picks as a repeat of design and is known as the plain weave.

2.5 FUNCTIONS OF THE LOOM

India has realized the significant role hand-loom and intermediate technology had played in its economic and social structure. According to Mehta and Agarwal (1984), "it was established that about 3.8 million hand looms were engaged in various localities in India. These hand-looms are producing some of the most equate fabrics," meeting some of India's demand for clothing and offering job opportunities for the society. Boon (1981) relates that, "the Chinese belief in the interpretation of appropriate technology using as much of the abundant labour as possible and as little of their scarce capital resources as a way of solving their employment and total labour problems in their society. Ada (1985) observed that, "further development of our achievements in intermediate (cottage industry) textile technology could result as in

China and India." The proper development of these crafts through organized instruction both for individuals and organizations could bring a beneficial creative impact.

2.6 MATERIALS FOR LOOM CONSTRUCTION IN TEXTILE DESIGN STUDIO.

Clarke (1974) considers, "textiles in general as a complicated art that grow popular among members of the human race even before the ages of modern technology." He traced the evolutions of fabric through the period of mechanical and scientific invention and finally to the time of man's achievement in that technology. Brostaff (1978) "emphasized that the principles and sources which other disciplines could offer for hand weaving that is the area of automotive engineering with its braking system, and carpentry played vital roles in constructing a flying shuttle loom."

The materials for the construction of studio based textile design looms are, the wood constructed by carpenters such as the frames of the loom, weaving and warping accessories; the metallic parts constructed by the metal workers, such as the reed, adjustments reels for both take-up and let-up beams, steel heddles and pulleys; other accessories are twines, clips, cloth for warp and cloth beams.

2.7 QUALITY OF IDEAL STUDIO BASED LOOM

Ada (1985) stated that, "the origin of the contemporary Nigerian institutionally trained weavers and their looms, could be traced to the time that weaving became a part of textile design in academic course programmes in Nigerian institutions of

higher learning." He went on to add that, "Ahmadu Bello University, Zaria started weaving courses in 1971 and at University of Nigeria Nsukka in the 1970s."

There are the Standard Dryad Floor and Table Looms with four to sixteen harnesses; and of course the traditional women vertical looms with fixed or rotating warps for different types of fabric construction. Ada (1985) added that, "the degree of involvement varied from one type of loom to the other. The techniques of warping, hacking, shedding and accessories appear the same with vertical and horizontal looms. Operational materials, methods and techniques have greater influence on practice."

2.8 THE NEED FOR MODIFICATION OF THE LOOM CURRENTLY IN USE

Most Hausa loom weavers are farmers as well; and their weaving is usually during the dry season and its proceeds being part of the farmers' general income. The use of the single pole undoubtedly derived from a tree, in the open which is possible in the dry season and still often just that, symbolizes clearly enough the roots of this craft in the country landscape. According to Lamb and Holmes (1980), "Hausa made weaving was very much on the decline, kept alive such as the demand for white sawaye cloth for burial shrouds and other cloth still sought after by the Saharan normads." See Appendix XI.

Ada (1985) stated that, "today, despite the problem of loom shortages, weaving as a course and enterprise seem to be gaining much attention in many Nigerian civil institutions or organizations. … On the other hand, the role of this craft has not yet been fully realized in the Nigerian military programme." According to Ada (1985),

“Gaji (1984) stated that, ‘it was further understood that traditional weaving initially was included as an ancillary course in the Oshodi Rehabilitation centre, but soon it was eliminated’. This is due to lack of standard looms for training in the course.” According to Dustenwai (2008), “calls and recommendations of some researchers were made including Adetoro (1980), Ugbolue (1980) and Dustenwai (1985), who unanimously agreed that research on indigenous small scale handcrafted textiles industries would enhance and change the status from traditional to commercially based modern small scale industry.”

According to Broudy (1979), “the earliest looms were likely vertical structures, though none have survived directly; the looms were referred to as warp weighted looms. The evidence for earlier vertical loom existence comes from sources, such as depictions of pictures on pottery and in paintings. The horizontal ground loom and the pit loom were later invented. Later developments made the building of looms easier and improved devices made the repetitive motions of weaving easier to the weaver”.

He then added that, “the long history of weaving and the innovation of looms have ultimately led to the development of the floor loom. The floor loom use pulleys and lever systems and allow the weaver to continuously weave yarns without interruption”. For greater efficiency and flexibility in design and execution, weavers today have the option of using computers to guide the floor loom such as the Leclerc weave bird in Plate 2.3 and Plate 2.4.

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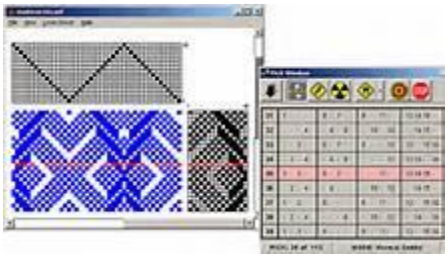


Plate 2.3 Leclerc Weavebird Computer Floor Loom

Source: Bing Images 2014

Plate 2.4 Computer Design Controller

According to Leclerc loom manufacturers (2014), "In designing the Weavebird, great effort was made to simplify the mechanism to minimize what can go wrong and to minimize the task involved to get the loom back working if things do not go right. Rather than the complex system of gears, springs, motors and levers found on other earlier Computer-Dobby loom designs, the Weavebird employs a simple closed cable system to raise and lower each harness. With this design, the only real adjustment the weaver may have to make to the loom is to adjust the length and tension of the cables. This is found in a loom that requires very little or no maintenance over the years."

Sankar (2012), "Since weaving is, at its most basic, a mathematical exercise, in fact computer was developed from Jacquard weaving head-motion and computers are

ideally suited for managing the increasing complexities of calculations required for more intricate and difficult designs".

According to Broudy (1979), "Looms can be powered by human power, by water, or by some kind of motor. Most looms today are power looms, powered by electricity but for most of human history they were powered by the human body. In the early Industrial Revolution, looms were among the first tools to become mechanized, as they were powered by water wheels in factories near running water. The large frame looms that have the warp yarns horizontally laid on warp and cloth beams have shed that could be opened and changed by depressing treadles".

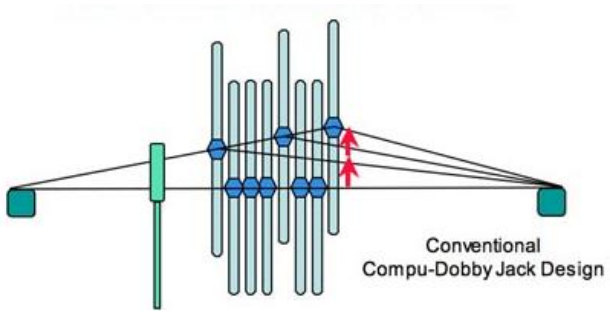


Plate 2.5 Opening of the Shed

Source: Leclerc Weavebird 2014

The treadles were tied to harnesses suspended in the frame on pulleys, so when the weaver stepped on a treadle, the harness attached will go down and a pair of harnesses will go up, forming a shed as in Plate 2.5.

The weaver's hands are free to throw the shuttle, which holds the weft yarn, and to beat the laid weft yarn to the cloth with a reed suspended from the bottom of the frame. According to anonymous, "weaving was one of the first productive industries to be industrialized. In the late 18th century, Edmund Cartwright invented a power

loom, but it took 50 years of refinement and development before the power loom could be a real industrial weaving machine." Anonymous added that, "The power loom relied more on raising the harnesses and warp threads, rather than depressing them. Steam drove the motors that raised the harnesses. The treadles were moved by cams attached to shafts that were turned by steam or water. The weft was inserted with the fly shuttle, also activated by shaft and cams rather than by humans. Take-up motion was automated as well: the loom advanced on its own as the cloth was woven." According to Sankar (2012), "Modern industrial looms are improved versions of the 18th and early19th century power looms. They weave much faster and with less wasted energy. Whereas early power looms could insert hundreds of picks per minute, modern looms insert thousands per minute. Power and automatic looms depend on the incorporation of an automatic weft change motion. They no longer use Shuttles the weft is propelled by air or water jets.



Plate 2.6: Shuttle-less Loom

Source: The Indian Textile Journal (2012)

Modern looms can be connected to computers that control the sheds, to create extremely complex weaves. The Jacquard loom which functions as the most ingenious weaving loom became history since 2008. The computer aided design (CAD) and the computer aided manufacture (CAM) have taken over the production of the elaborate fabric manufacture.

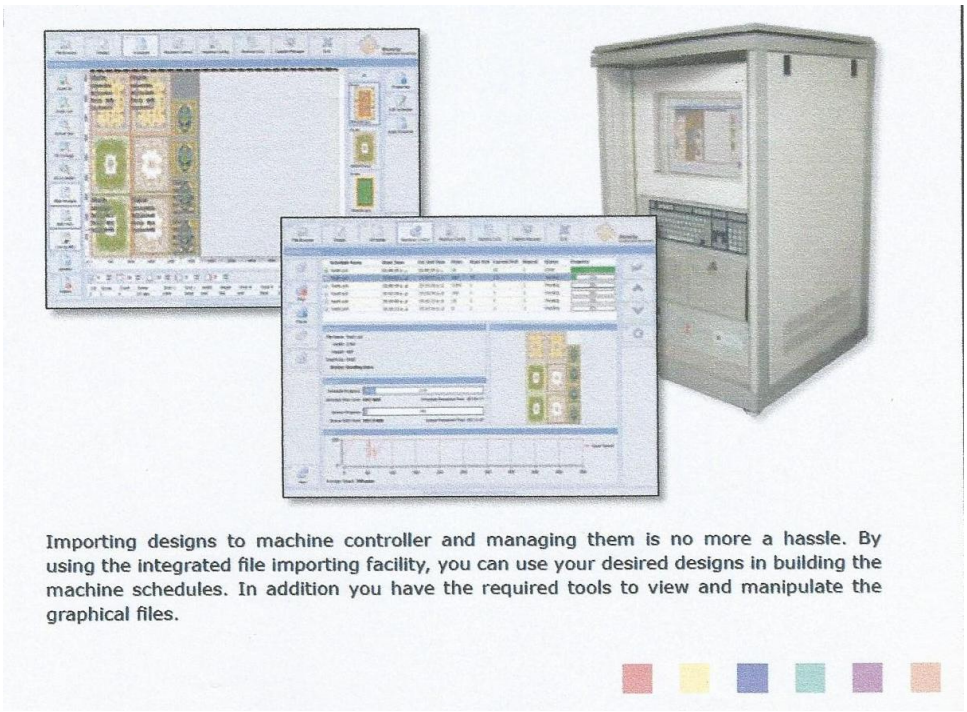


Plate 2.7: Booria Loom Controller

Source: BOORIA CAD/CAM SYSTEMS (2012)

Gwari and Maiwada (2009) stated that, "it is however very important to acknowledge the fact that outsiders generally see only the results of using a system and rarely the methods that are employed to achieve them." They went on to add that, "number one on the list of purchase of CAD/CAM system is probably the cost, but really it should be the personnel. The human element contributes significantly to the success of a CAD/CAM project, and users in the design studio and their creative ability,

complementing the human talent rather than threatening it. It is worth noting, that it is design skill that leads to the success of CAD/CAM, not good technology."



Plate 2.8: Designers Pad for the Loom Controller

Source: BOORIA CAD/CAM SYSTEMS (2012)

The designer's pad for the Booria CAD/CAM loom has to be managed by creative and trained personnel in order to produce fabrics that could march the financial investments of the management team.

CHAPTER THREE

METHODOLOGY

3.1 INTRODUCTION

The methods used in this study are: field survey and practical participant observation methods for the construction of the modified loom with the help of carpenters and metal workers who produced the loom parts according to the drawings of the researcher. When the loom was constructed, different weaving techniques were employed to achieve the aesthetic and design qualities of the traditional fabric. The woven fabrics from the modified loom were compared for analysis with the fabrics woven on the traditional loom.

According to Phillips (2008) "The key to the approach is to keep firmly in mind that the classic position of a researcher is not that of one who knows the right answers, but of one who is struggling to find out what the right answers might be." Kerlinger (1978) adds that, research design is to "plan structure and strategy of investigation conceived to obtain answers to research questions and to control variance." Maiwada (2001) states that "the scientific evaluation of any problem must follow a sequence of steps in order to increase the chances of producing relevant data,"

3.2 METHODOLOGY

The methodology which was used for this study includes the following:

Survey of various traditional men's horizontal looms.

Participant observation of the traditional weaving techniques with the narrow horizontal loom were conducted and compared with studio based methods using the four shaft floor loom.

Construction of a modified loom model to give greater productivity.

The sketches of all parts of the modified loom were made in terms of the materials to be used, like wood frames, metallic parts and strings. Data collection on the sampling opinions of some of the traditional weavers, users and marketers of the traditional dress were made.

It took the carpenters of Industrial Development Center, Zaria, (IDC) seven months to produce the loom frames from December 2011 to June 2012. The lower loom frame was first assembled using bolts and nuts to hold the arms. Then the upper frame was mounted on top of the lower frame. The warp and cloth beams were inserted into their correct positions. A canvas sheet measuring two metres was attached to the beams, with 1¼ metres to the cloth beam and ¾ metre to the warp beam. The canvas cloth was used to maximise warp yarns usage when weaving starts and when weaving comes to an end.

Questionnaires were designed and administered on selected traditional weavers and users of the traditional fabric to enable the study to evaluate outcomes based on the defects of the traditional loom which affects the production output.

3.3 PILOT STUDY

Pilot study according to Adetoro (1980) “is the preliminary survey undertaken by a researcher to acquaint him/herself with the actual situation in the research area before the actual research.” Rothman (1980) also stated that “it is an extremely important

step in moving from theory to practice and provides the tools and procedures through which the large scale undertaking can take place."

The researcher as a weaving designer has basic knowledge of industrial and studio based weaving techniques. A preliminary survey of the men's traditional looms and their products was undertaken to study the products and the different parts of the loom to be modified. The results were compared for analysis with the studio based looms.

The researcher found the International hand-woven textile market area, comprising a long veranda, some stalls and others under some trees. The researcher started with the cotton dealers, who sell raw cotton from the farm; shared into small hips of cotton wool sold, at fifty Nigerian Naira (N50.00) each as in Plate 3.1.



Plate 3.1: Cotton fibres.

Source: Photographed by M. Y. Waziri (2012)

Buyers come from all over the villages to purchase the raw cotton and bring it back to the market as hand spun yarns as in Plate 3.1. This varies depending on what type of yarn the spinner wants to spin. Yarns were spun and sold at the market for all types of

purposes. For example, the yarns spun as warps had a stronger and tighter spin than the ones for the weft yarns, which were thicker and loosely spun as in Plate 3.2.



Plate 3.2: Spools of Hand Spun Yarns

Source: Photographed by M. Y. Waziri (2012)

The person who makes the warp yarns buys the spindles made for warping. The warping is done on walls or fences. The prepared warp yarns are packed in small hangs and sold to the weavers. These prepared warp yarns are also made with machine made yarns. Some weavers come to the market to buy prepared warp yarns for their weaving. As for the weft yarns they are also acquired in the same way depending on the type of fabric the weaver wants to weave.



Plate 3.3: The Heddles of the Turkudi Loom

Source: Photographed by M. Y. Waziri (2012)

As for the loom parts, the dealers sell different types of loom parts depending on the weavers demand. Some come to market to buy for the replacement of their loom parts and others buy new loom parts to assemble new looms and that too depends on the type of fabric they want to weave. The heddles in Plate 3.3 and beater in Plate 3.4 are among the Turkudi loom parts.



Plate 3.4: Reed or Comb of the Traditional Turkudi Loom

Source: Photographed by M. Y. Waziri (2012)

As for the finished products of the traditional loom the weavers bring their products in rolls of strips of cloth as in Plates 3.5, 3.6 and 3.7, to the market to sell to either the dealers on strips of cloth or the hand tailors. The hand tailors buy the finished products in rolls of strip of fabric and then fabricate them into different types of clothes and garments.



Plate 3.5: Product of the Zugu loom



Plate 3.6: Product of the Turkudi loom



Plate 3.7: Product of the Turkudi Loom

Source: Photographed by M. Y. Waziri (2012)

Plate 3.5 is the product of Zugu loom and though bigger in size than Plates 3.6 and 3.7 which are from the Turkudi loom, is less costly than the two. The yarns used in the production of Plate 3.5 are thicker and loosely spun. So the yarns are less costly and fabric can be woven faster than those in Plates 3.6 and 3.7. Plate 3.6 too is less costly

than Plate 3.7 and though similar in size; the fibres from which the yarns woven in Plate 3.7 are of grade 1 cotton, and spun finer than the ones made in Plate 3.6.



Plate 3.8 Cloths Woven on the Traditional Narrow Horizontal Looms

Source: Photographed by M. Y. Waziri (2012)

The first product on Plate 3.8 is a fabric woven on the Sawaye loom, with wider strips than that of the Zugu next to it on the same Plate. The fabric next to Zugu is the third from the left and is woven on the Turkudi loom. The fourth fabric in the Plate 3.8 which is the first on the right is an indigo dyed fabric. All these materials, equipment and the fabrics were acquired for the analysis with the modified loom and its products.

3.4 RESEARCH DESIGN.

Adetoro (1997) stated that, “research design is a framework, as a plan which consists of the overall detailed programme of any research which attempts to find out how the objectives of the research will be achieved and how the problems that will be encountered will be solved.” In solving the problems to be encountered an appropriate method must be used to achieve the required objectives.

For the construction of the modified loom, field practical and participant observation methods were used, with the help of carpenters and metal workers who produced the loom parts according to the drawings of the researcher. When the loom was constructed, different weaving techniques were employed to achieve the aesthetic and design qualities of the traditional narrow strip fabric. Two types of questionnaires were prepared one for the traditional weavers and traditional loom manufacturers on the modified loom and the second questionnaire was for users and marketers of traditional dress, on the products of the modified loom.

3.4.1 Problem-Solving Research.

According to Phillips (2008) this type of research starts from a particular problem in the real world, and brings together all the intellectual resources that can be brought to bear on its solution. He added that, “the person working in this way may have to create and identify original problem solutions every step of the way.” Problem-solving research method was adapted for this study because of its relevance. The relevance of this method is in the modification of the men’s traditional loom in order to enhance efficiency and increase productivity as a solution to the already disappearing traditional craft due to its low production output.

According to Lamb and Holmes (1980), "The Turkudi loom is tiny, at first sight almost a toy. In fact it is just a miniature version of the Hausa loom type with single pole and rope-secured breast beam. Apart from the extreme narrowness of the warp, the most striking feature of this loom is that the weaver sits with his legs over the breast beam. There is no heddle pulley, instead, a rocker or horse *shuwaka* is used, an oscillating bar connecting the pair of heddles." Dutsenwai (1985) reports that, "It is rather hearting to think that one is supporting a nations' heritage by buying a length of hand-woven cotton, not only is one ensuring that countless generations of traditional craft-work will not die out, but is also giving impetus to the revival of skills on the point of disappearing."

The problem of this research is to modify the men's horizontal loom that can increase production output, so that we can utilize more of our traditional dress, because of their relevance to our society. And this will also help the craftsmen and the craft itself to survive in the Nigerian economic market.

3.5 POPULATION OF THE STUDY.

The narrow men's horizontal treadle loom is found through-out West Africa from Senegal to Cameroon in the belt between the Sahara and the Atlantic Ocean. The population of this study includes *Turkudi, Zugu and Sawaye* of Hausa men's traditional looms found in Kura town, Kano State. Others who are directly connected to the population of this study are traders in traditional textile fabrics produced with these looms.

3.6 SAMPLE OF THE STUDY.

By concentrating on this region and studying a town that engages in almost all Hausa men's horizontal looms, the researcher is within the reach of having a fair sample of the *Turkudi, Zugu and Sawaye* looms, the traditional weavers, the users and traders of the traditional woven fabrics. Kura town in Kano state is still known in the international market for its contribution in weaving and dyeing men's traditional woven textiles.

3.6.1 Sampling Techniques of the Study.

Sampling techniques help the researcher to identify elements in a population under study and selecting a method for generalization. The sampling technique which was used for this study was the cluster sampling technique. This technique allows the researcher to determine whether the hypothesis is to be kept or rejected. This technique according to Ahuwan (2010) "allows the researcher to concentrate on a particular unit that represents the whole population for easier generalizations."

According to Lamb and Holmes (1980), "the Hausa men weavers use the narrow horizontal loom and weave an amazing variety of cloth, in design, in width of strip, and in density or weight of weave. It is extraordinary that from this region come both the narrowest strip well under one inch (2.5cm) in width and also the widest around two feet (60cm), all made on looms which are in many essentials the same and also gauze-like veils and heavy blankets".

3.7 INSTRUMENTS FOR DATA COLLECTION.

For the men's traditional weaving looms, the researcher used the participant – observation method, in studying the traditional loom parts, which were compared with the studio based looms for the modification. According to Oguntona (1980) "participatory activities allow accessibility to certain situations and information some not always equally accessible, or not as quickly, to an 'outside researcher." He then added that, "by virtue of participatory activity, the 'inside' researcher is right there where the action is and where people talk about what is happening so as to record true life situations." Questionnaires and interviews were prepared for the traditional weavers, consumers of the traditional woven cloth, and the marketers based on scales to obtain data concerning subjects, attitudes and judgments or perception about the modified loom.

The scale used is the Likert scale which is called an equal appearing interval scale. The Likert scale is a five point scale in which the interval between each point is assumed to be equal. It is used to register the extent of agreement or disagreement with a particular statement of an attitude, belief or judgment.

3.7.1 Data collection.

Questionnaires and interviews contain pre-coded information, direct or face-to-face interview with the traditional weavers, marketers and users of the traditional fabrics. Different parts of the men's horizontal loom were observed and modified based on the researcher's experience on the industrial and studio based looms.

3.8 RESEARCH ACTIVITIES.

The design of a modified mechanised men's horizontal loom was as illustrated in Figures 3.1, 3.2, 3.3, 3.4, and 3.5, drawings as;

Figure 3.1: drawing of the upper frame

Figure 3.2: drawing of the lower frame

Figure 3.3: drawing of the beater

Figure 3.4: drawing of the warp and cloth beams

Figure 3.5: loom weaving accessories.

The loom was constructed using the drawings stated above at the Industrial Development Centre, (IDC) Zaria, under the Federal Ministry of Industries. The wooden parts of the loom were produced in their workshop by their carpenters as specified by the researcher, and the metallic parts were produced in the old *Panteka* market in Kaduna.

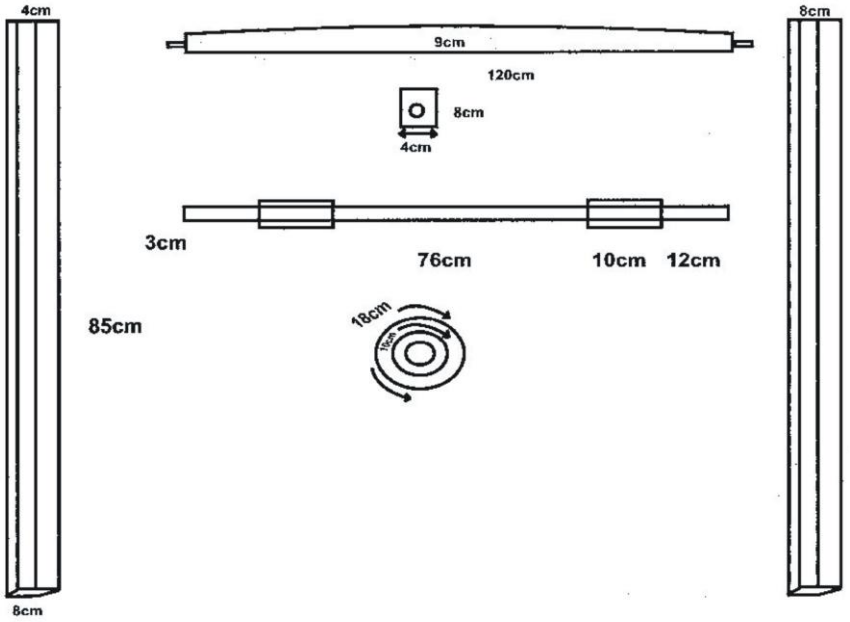


Figure 3.1 Sketch of the Upper Frame

The frame carries the heddle shafts which rotate on a flexible wooden cylinder that holds the ropes and acts as a pulley.

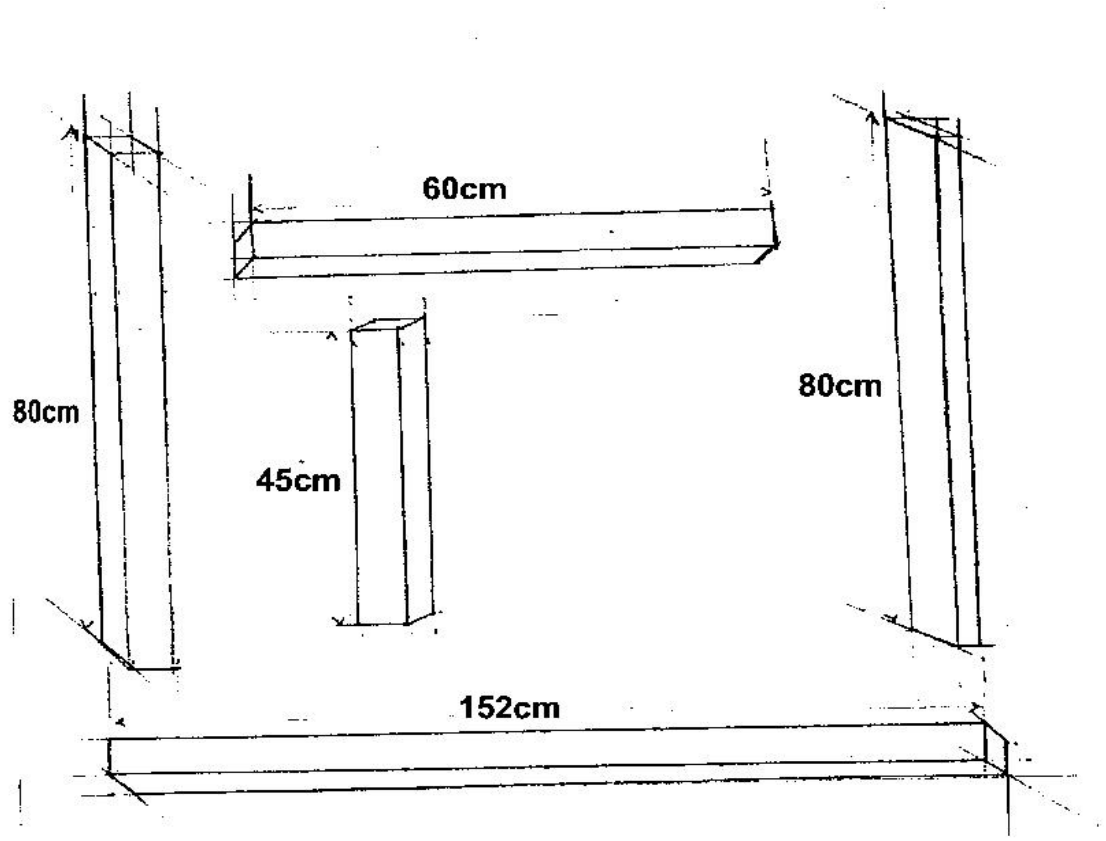


Figure 3.2: Sketch of the Lower Frame

The lower frame is the base of the loom that carries all loom accessories, from which the weaving operation takes place.

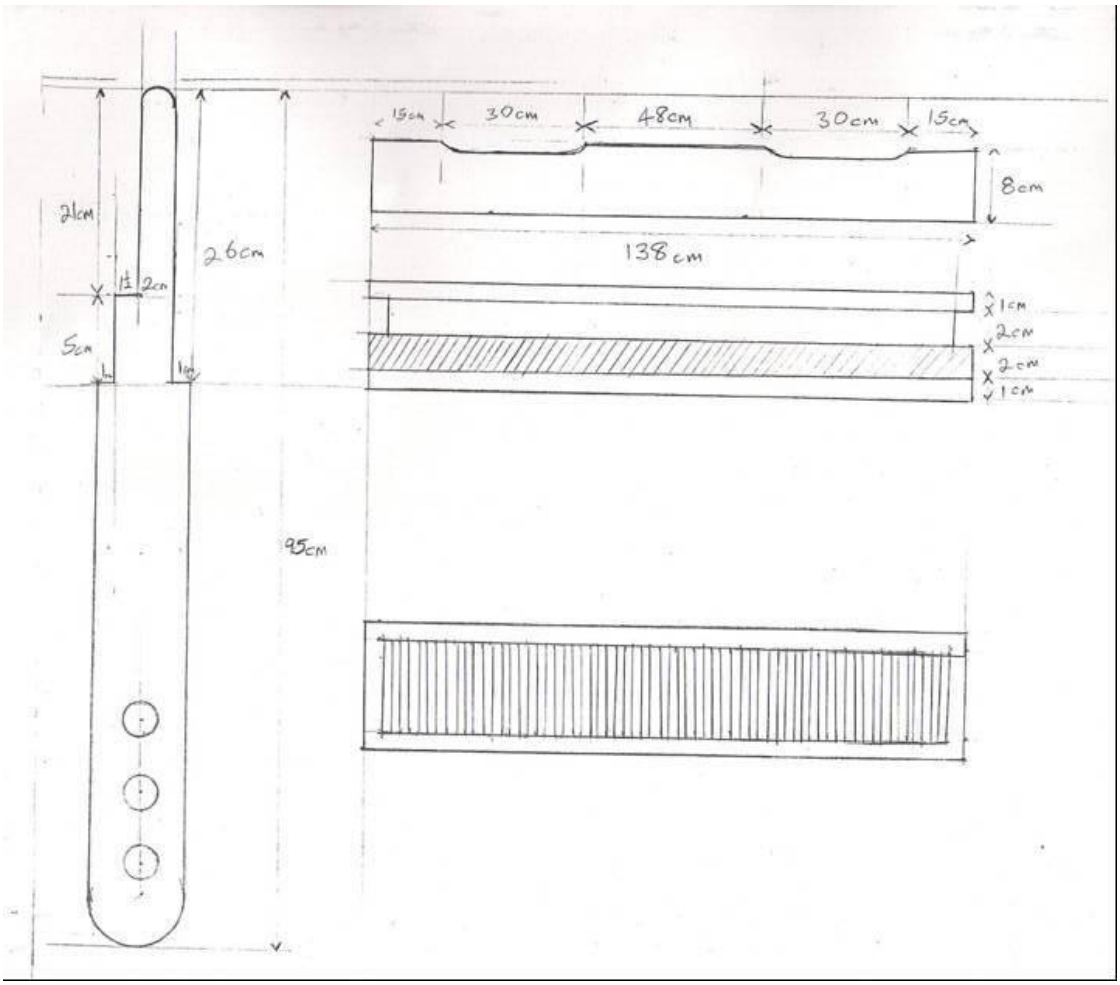


Figure 3.3: Sketch of the Beater frame

The beater frame holds the reed which separates the warp yarns on the loom after loom-dressing. The frame also helps in parking the weft yarns in the shed to the woven fabric under construction using the reed as a comb.

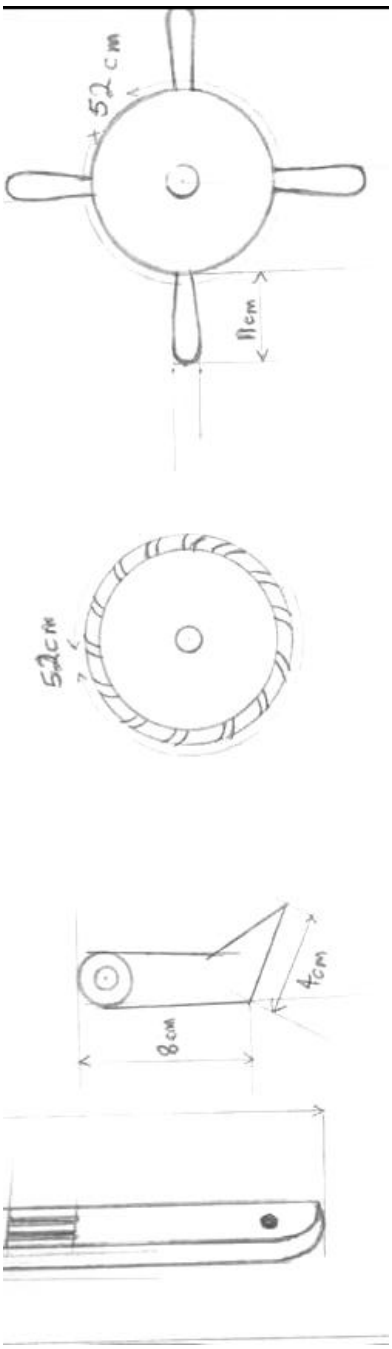


Figure 3.4 Sketch for the Warp and Cloth Beam

The warp and the cloth beams are the heart of the loom that carry the warp yarns and facilitate the opening of the warp yarns to form a shed for weft insertion during the weaving operation.

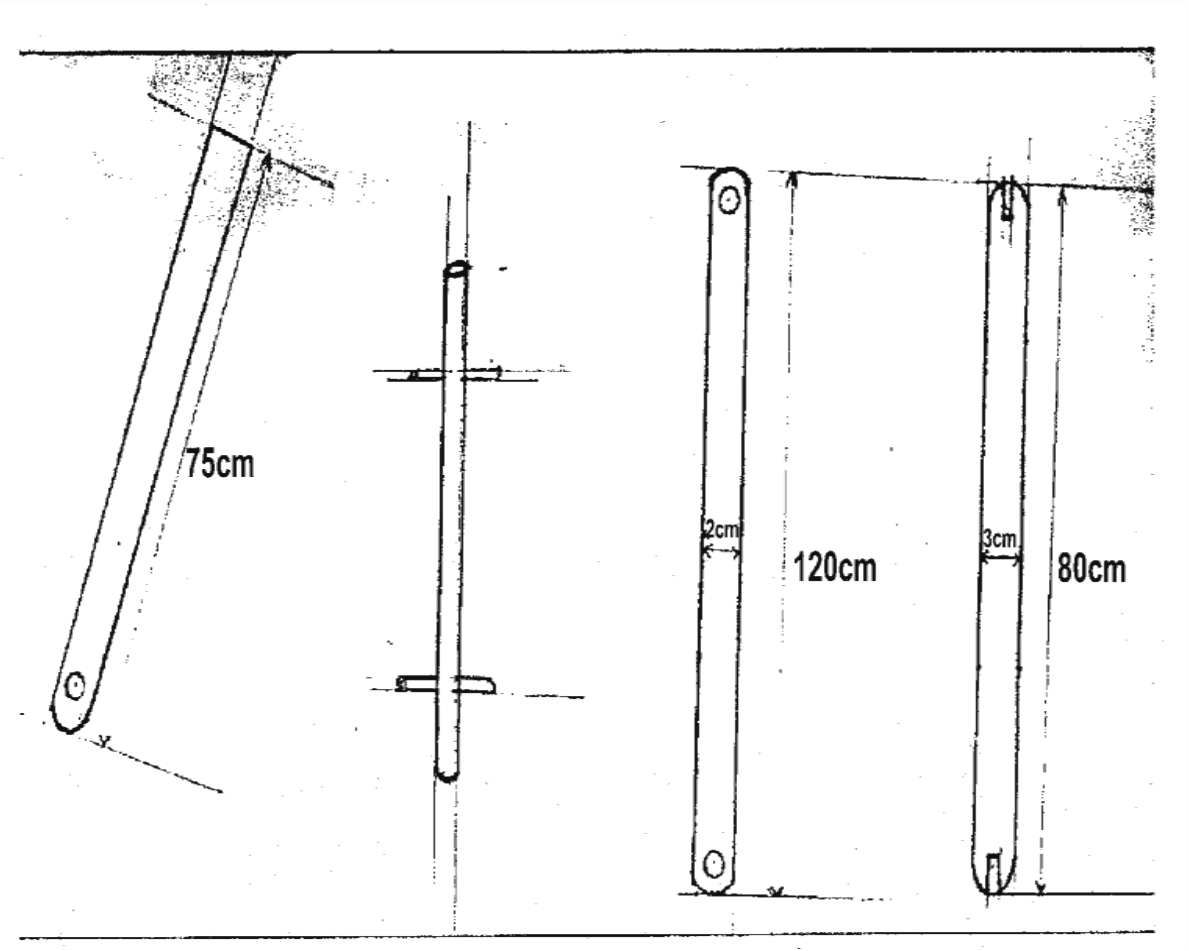


Figure 3.5 Sketch of the Loom Weaving Accessories

3.8.1 Construction of the Modified Loom.

The warp beam is a beam that holds the warp yarns, or vertical yarns, on the loom for easier threading of the loom. Heddles were made of cords and were attached to the shaft frames of the loom. The warp yarns were passed through the eyes of the heddles, in order to separate the warp threads to allow the weft yarns to pass between them

easily. The more harnesses or shafts a loom has, the more design possibilities the weaver will have.

When all the parts of the loom were produced, they were fabricated in the following manner:

The parts produced in sketch (a) were assembled to form the upper frame. This was made by the carpenters who produced the parts under the researcher's supervision.

These parts in sketch (b) were assembled to form the lower frame.

Drawings in sketch (c) were assembled to form the loom beater.

The parts produced in sketch (d) were assembled to form the cloth and warp beams.

Sketch(e) was the loom and weaving accessories.

The loom has four harnesses. The shuttle stick holds the weft yarns. The shuttle was passed back and forth to form the weft of the fabric. The beater of the loom presses the newly formed weft yarns against the already woven fabric using the reed and this process is called beat-up, referring to the action of the beater as it pushes the weft into the edge of the fabric.



Plate 3.9: Wooden Lower Frames of the Modified Loom

Source: Photographed by M. Y. Waziri (2012)

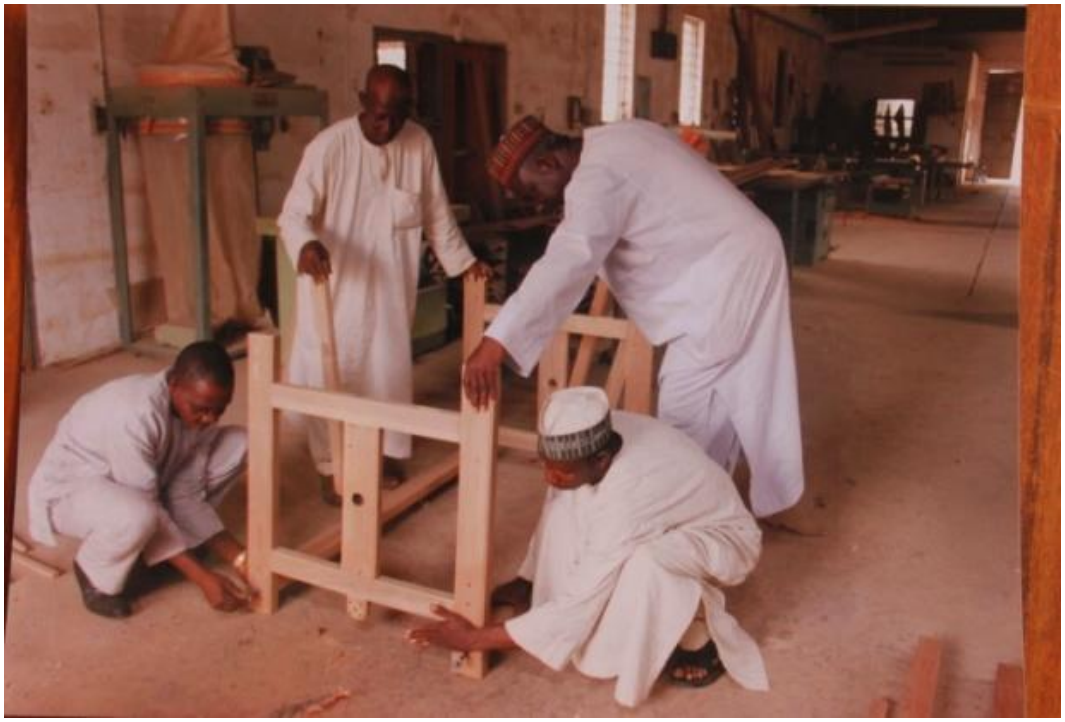


Plate 3.10: Assembling the Lower Frame of the Modified Loom

Source: Photographed by Abdullahi (2012)

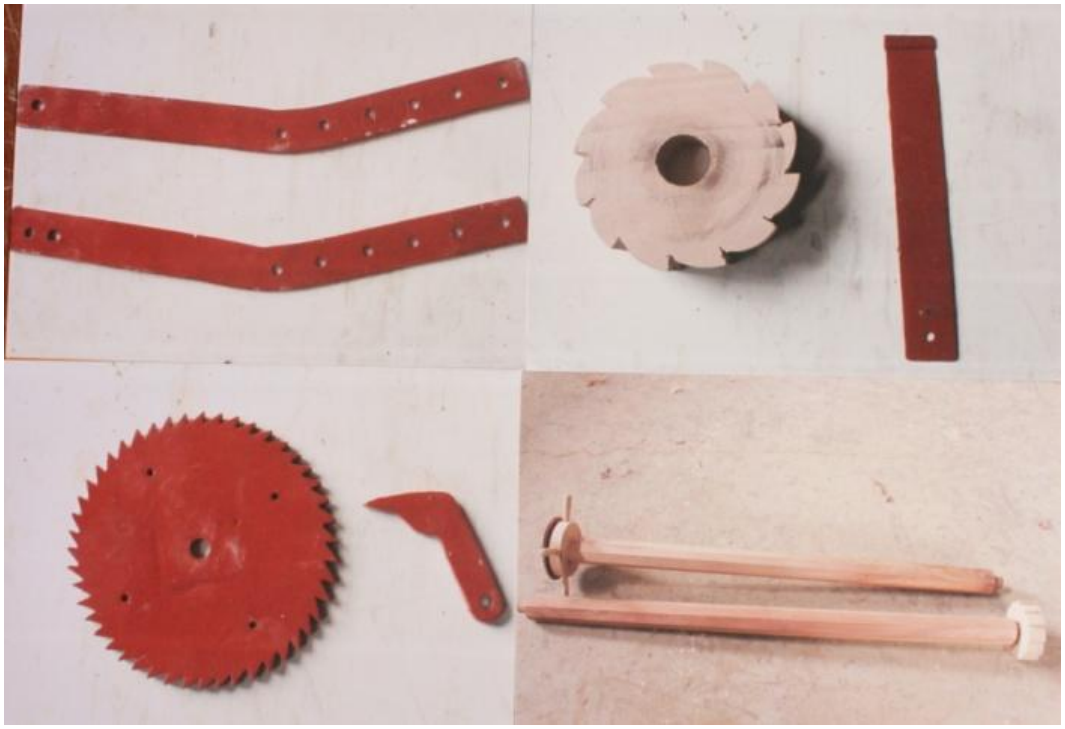


Plate 3.11 Wooden accessories and metallic parts of the modified loom

Source: Photographed by M. Y. Waziri (2012)

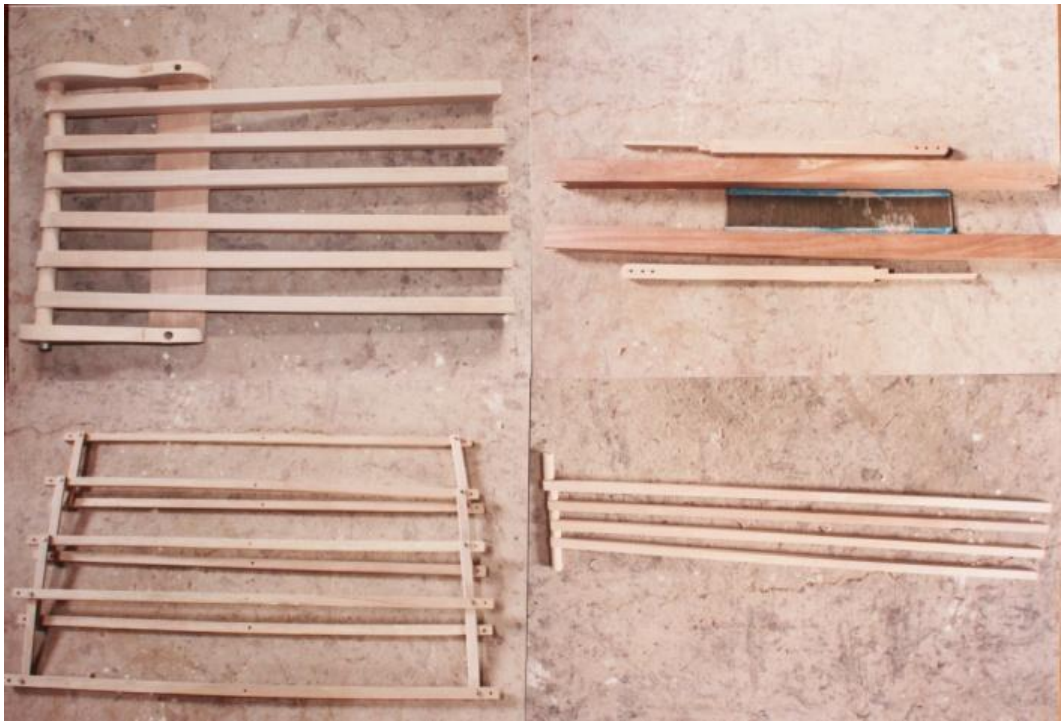


Plate 3.12: Wooden accessories

Source: Photographed by M. Y. Waziri (2012)

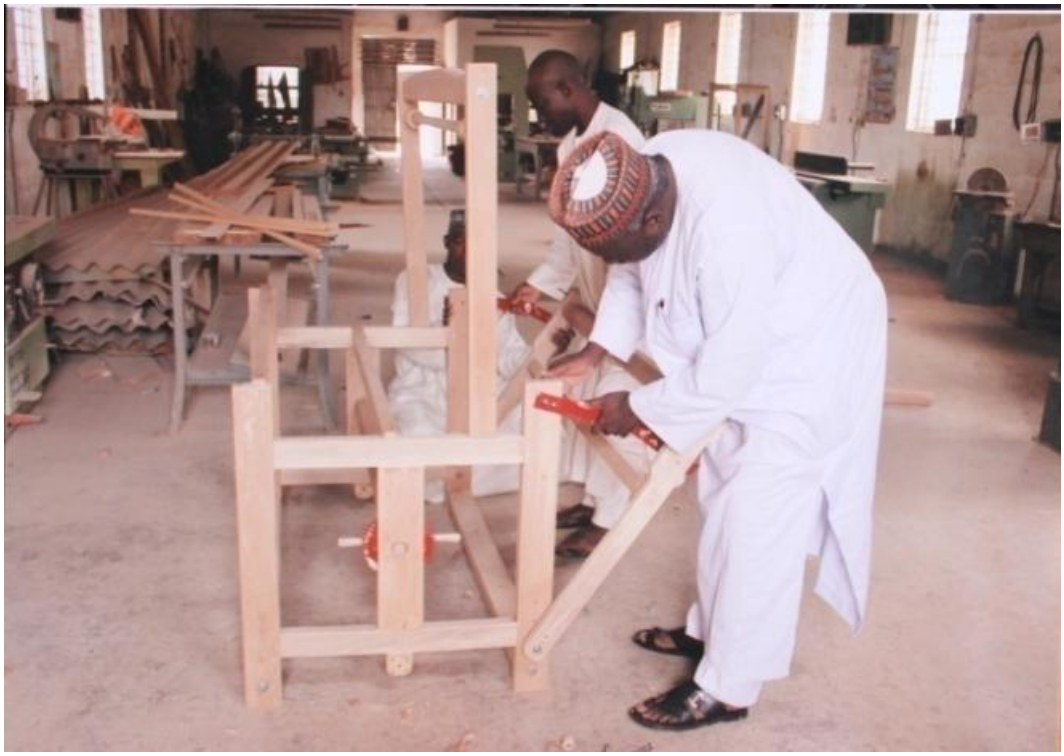


Plate 3.13: Assembling the modified loom

Source: Photographed by Abdullahi (2012)

All these parts were produced and assembled as planned by the researcher. The loom frame was assembled with the help of the technical staff of the I.D.C. Zaria. This was first done in their workshop for testing the perfection of all the loom parts produced.



Plate 3.14 Assembling the modified loom continues

Source: Photographed by Abdullahi (2012)

The researcher collected the loom frames and then proceeded with the production of the heddles, shaft-pulleys and the tie-up of the shafts to the pedals. The Reed used was a used reed from one of our former textile industries with 28 warp threads to an inch (2.5cm). The next production was the heddles and heddle frames. These were produced with twines and the ropes for tie-ups from the heddle shafts. When the loom was produced then the warping-preparations of the warps was done on the warp frame to form a shed.

3.9 MODIFICATIONS OF THE HORIZONTAL LOOM

The modifications of the horizontal loom involved the following:



Plate 3.15 beater



Plate 3.16 reed

The beater in Plate 3.15 was modified to the beater in Plate 3.16.

Source: Photographed by M. Y. Waziri (2012)

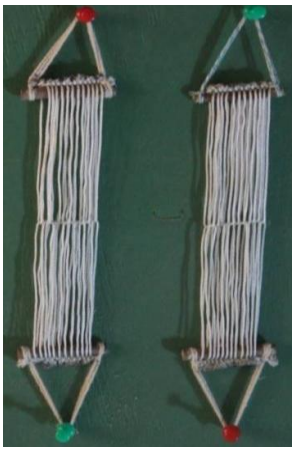


Plate 3.17



Plate 3.18 heddles

The heddles of the horizontal loom in Plate 3.17 were modified to the heddles in Plate 3.18. Source: Photographed by M. Y. Waziri (2012)



Plate 3.19: Pedals

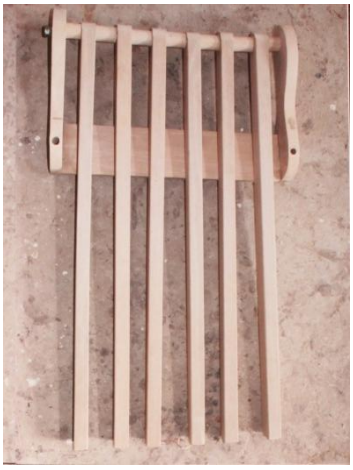


Plate 3.20: Pedals

The pedals of the horizontal loom in Plate 3.19 was modified to the pedals of the modified loom in Plate 3.20

Source: Photographed by M. Y. Waziri (2012)



Plate 3.21: Drag weight



Plate 3.22: Warp beam

The drag weight holding the warp yarns on the horizontal loom on Plate 3.21 was changed to the warp beam which carries the warp yarns of the modified loom on Plate 3.22.

Source: Photographed by M. Y. Waziri (2012)

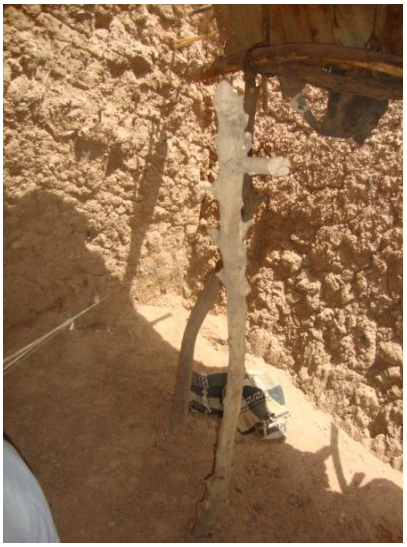




Plate 3.23: Single pole **Plate 3.24: Heddle pulleys**

The single pole holding the shafts for oscillation of the heddles of the horizontal loom on Plate 3.23 was modified to the heddle pulleys on a rotating wooden cylinder on Plate 3.2

Source: Photographed by M. Y. Waziri (2012)





Plate 3.25: Horizontal loom **Plate 3.26: Modified loom**

The narrow horizontal loom on Plate 3.25 was modified to a four shafts floor loom on Plate 3.26.

Source: Plate 3.25: Photographed by M. Y. Waziri (2012)

Source: Plate 3.26: Photographed by Abdullahi (2012





Plate 3.27: horizontal loom **Plate 3.28: modified loom**

The weaving on the horizontal loom on Plate 3.27 was modified to the weaving on the modified loom on Plate 3.28.

Source: Plate 3.25: Photographed by M. Y. Waziri (2012)

Source: Plate 3.26: Photographed by Abdullahi (2012)

The warping operation starts with measuring the required length of the warp yarn. The warp yarns were wound on warping frame with the formation of a shed as in Figure 3.29, to keep the warp threads in order using the cross sticks. The warp yarns were removed from the frame and are tied to the warp beam.



Plate 3.29: Warping to form a shed on the warp frame

Source: Photographed by M. Y. Waziri (2012)



Plate 3.30: Warping on the warp frame

Source: Photographed by Abdullahi (2012)

The warping preparations were done in the Textile Design Section of the Department of Industrial Design, Ahmadu Bello University, Zaria. The warps were transferred to the loom by winding the warp yarns on to the warp beam. This was done manually, with the help of textile design section technical staff.



Plate 3.31: Beaming of the modified loom

Source: Photographed by M. Y. Waziri (2012)



Plate 3.32: Beaming of the modified loom

Source: Photographed by M. Y. Waziri (2012)

When the warp yarns were transferred to the warp beam, the next step in the weaving preparation was to pass the warp yarns through the eyes of the heddles using a hook and according to the order of warping operation. This was done with the help of weaving draft according to the drawing-in draft (D.I.D). The D.I.D shows the order in which each individual warp thread is drawn in to the shafts of the loom. The drawing–in-draft was a straight draft because the weave plan was a plain weave.



Plate 3.33: Threading the warp yarns on the modified loom

Source: Photographed by Abdullahi (2012)

The warp yarns were transferred to the warp beam, the threading of the individual warp yarn into the eye of individual heddle starts with the help of the hook as in Plate 3.33. This was done according to design and drawing-in- draft plan the (D.I.D). The warps were sleyed by passing each warp through the dents of the reed which serves as a comb with the help of a hook. When these processes were made, the warps were tied to the cloth beam and then pulled to the required tension.

Then the loom was ready for weaving. The weft yarn was then wound on the shuttle stick and ready for insertion as planned by the weaver. For the first weaving operation, the loom used two pedals, four lams and four shafts. On each shaft, there were 132 heddles made with twine threads, making a total of 132 x 4 =528 heddles.

All these were mounted into their correct positions on the loom. With these attachments a four harness counterbalance floor loom was constructed.

The modified loom consists of five major motions which must work together to manipulate the warp and weft yarns in making a fabric. These five motions are classified as primary motions and secondary motions. The primary motions are; the shedding, the picking and the beating-up. These motions are called primary because they constitute the major loom action of weaving, the interlacing of two yarns system. The secondary motions include the let-off motion for allowing more warp yarns from the warp beam and the take-up motion for packing the woven fabric to the cloth beam. Although they are called secondary motions, their functions are very much needed for continuity of the fabric weaving operation.

The shedding motion has two operational functions, first to make an opening between the warp yarns for the passage of the weft yarn and second, to close the opening of the warp yarns to cross over and under the weft yarn and interlace it to form a fabric. The picking motion has only one function, that of placing the weft yarn in to the shed opening provided by the shedding motion which separates the warp yarns with the shafts pulling some yarns up and bringing some down according to chain draft C.D. The shuttle carrying the weft yarn is being propelled through the shed, which leaves a trail of yarn behind as it passes through the opening shed formed by the warp yarns.

The beating-up motion consists of a reed through which the warp yarns are drawn and spaced properly. This reed serves as a comb to pass between the warp yarns and push the weft yarns up to the fabric under construction. This is called the beat-up motion referring to the action of the reed as it pushes the weft yarn into the body of the fabric being woven. The let-off motion provides more yarns needed for the

weaving operation while the take-up motion removes the fabric as it is woven on the loom.

3.10 THE PLAIN WEAVE DESIGN

Designing is a term that has more than one meaning to a textile designer. As a verb, design means to plan or fashion; and as a noun it means sketch, draft, or scheme. Graph paper was used in the structural textile designing. An attempt is always made to use a graph paper that coincides closely with the planned fabric construction. On this graph paper each square represents the intersection of the warp and the weft yarns. Colouring the squares means one thing and leaving them blank means something else, depending on which part of the plan is being drafted. For the design, a vertical column of squares represents one single warp yarn and a horizontal row of squares represents one single weft yarn. Any one square represents the point at which one warp and one weft interlace. Colouring a square means that the warp end is raised over the weft pick, while a blank square means that the warp end is lowered under the weft pick. In a design the square in the lower left corner represents the interlacing between the number one warp and the number one weft. This rule is always followed because a warp is viewed usually from left to right and the fabric is read from bottom to top.

To design or plan the structure of a fabric, four things must be taken into consideration;

1. The weave plan that is the design itself or order of interlacing between the warp and weft yarns.

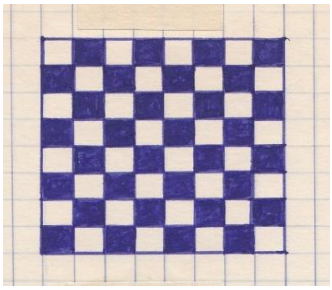


Figure 3.6: Plain weave design

Source: Drafted by M. Y. Waziri (2012)

For the design itself a vertical column of squares represents one single warp yarn and a horizontal row of squares represents one single weft yarn. Any one square represents a point at which one warp yarn and one weft yarn interlace. The shading of one square means that the warp yarn is raised over the weft yarn while a blank square means the warp yarn is lowered under the weft yarn. In the design above the first square in the lower left corner represents the interlacing between the number one warp yarn and the number one weft yarn.

The weave design shows the relationship between the warps and the wefts yarns.

2. The drawing-in-draft, that is the entering plan or order by which the warp threads are entered in to the harness, (D.I.D.)

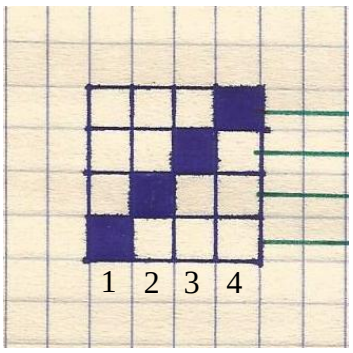


Figure 3.7: Drawing-in-draft (D.I.D)

Source: Drafted by M. Y. Waziri (2012)

The drawing-in-draft (D.I.D) is being drafted with the vertical columns of squares representing the warp yarns, but the horizontal rows of squares in the D.I.D. represent the harnesses. A coloured square means that the warp yarn represented by the vertical row of squares is being controlled by the harness represented by the horizontal row of squares. The D.I.D is usually located above the design. The D.I.D shows the relationship between the warps and the harnesses.

3. The chain or cam draft that is the lifting plan of the warp yarns for the insertion of the weft pick in the design, (C.D)

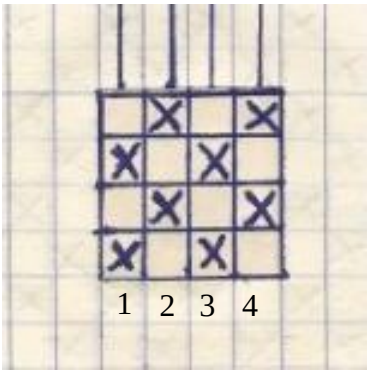


Figure 3.8: Chain draft (C.D)

Source: Drafted by M. Y. Waziri (2012)

To the right side of the design on graph paper chain draft is given by the horizontal row of squares which represent the weft yarns as they did on the design but the vertical column of squares which represent the harnesses. The C.D. shows on each insertion of the weft yarn, which harnesses are raised and are lowered. Colouring a square indicates that the harness is raised on that particular pick. A blank square indicates that the harness is lowered on that particular pick. The C.D shows the relationship between wefts and harnesses.

4. Reed plan, that is the order and number of the warp yarns to be entered through the reed.

(R.P.)

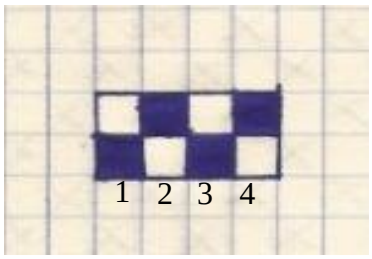


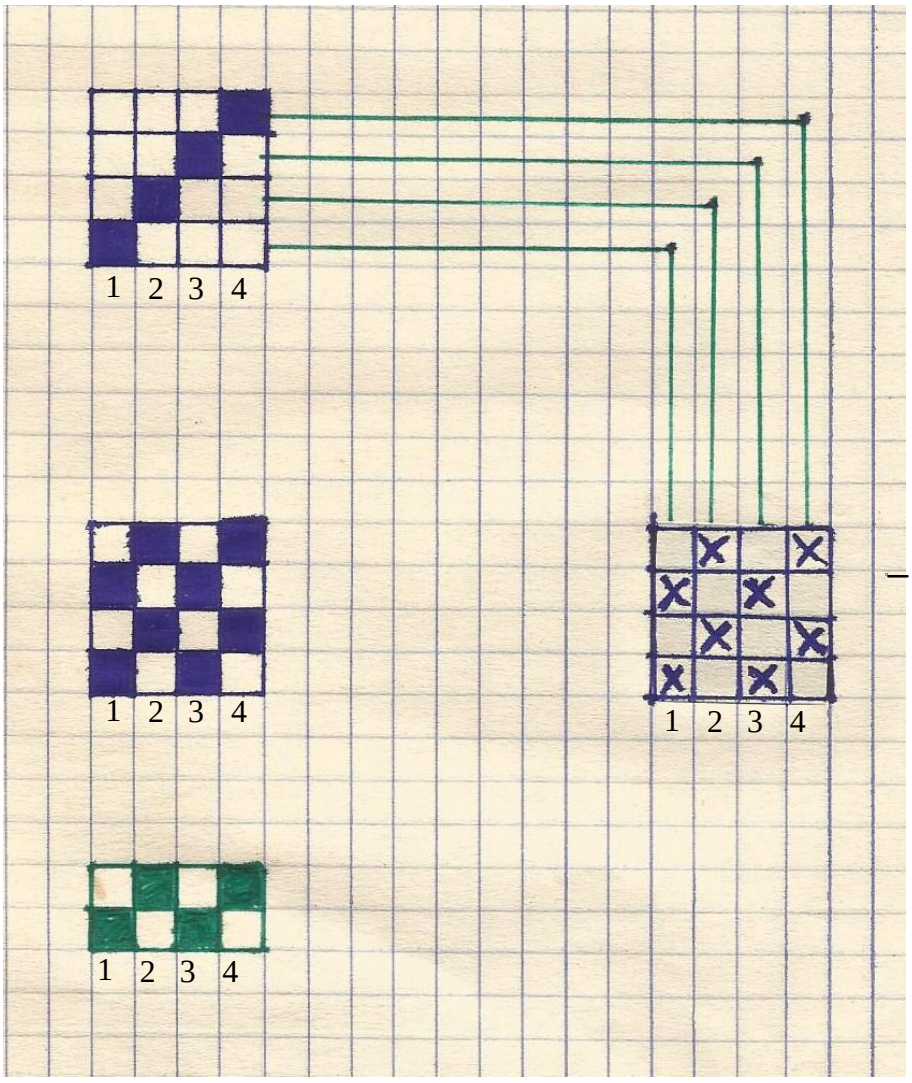
Figure 3.9: Reed plan (R.P)

Source: Drafted by M. Y. Waziri (2012)

The reed plan is always shown below the design, with a broken square-line which indicates the number of warp yarns to be drawn through each dent in the reed. The reed plan (R.P.) shows the relationship between warp yarns and the dents in the reed

If shown on the same sheet of paper, above the design, the drawing-in-draft is usually given. Here the vertical columns of squares represent harnesses. A coloured square means that the end represented by that vertical row of squares is raised. Each end in the design must be drawn through only one harness and indication for all the ends in the design must be shown in the unit design constructed using a graph paper.

Drawing-in-draft (D.I.D)



Chain draft (C.D)

Reed Plan (R.P)

Figure 3.10: Weave design draft.

Source: Drafted by M. Y. Waziri (2012)

To the right of the design, the chain draft (CD) or lifting plan is given. Horizontal rows of squares represent picks as they did in the design but vertical columns of squares now represent the harnesses. The chain draft shows on each pick of the

design, which harnesses are raised and which harnesses are lowered. Colouring indicates that the harness is lowered on that particular pick.

3.11 DATA PRESENTATION AND ANALYSIS

The modified woven samples used for the interview conducted with the respondents in this research were the fabrics woven on the modified loom model. The following is the presentation for analysis and discussions of data obtained from interviews through questionnaires and the participant observation methods, administered on the horizontal narrow strip cloth productions, marketing and usage.

The researcher drafted the questionnaires based on Likert scale of five levels of equal inter scale, starting with (a) very strongly agreed, (b) strongly agreed, (c) agreed, (d) fairly agreed and (e) not agreed.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 INTRODUCTION

According to Phillips (2008) this type of research starts from a particular problem in the real world, and brings together all the intellectual resources that can be brought to bear on its solution. He added that, "the person working in this way may have to create and identify original problem solutions every step of the way."

The textile designer is the originator of the finished textile products. The designer should be involved in the production of the latest machinery, for a successful textiles manufacture to be achieved. In designing for the structural and applied types of designs, the designer is expected to create his designs and know the techniques of weaving, embroidery, knitting, printing, mechanised as well as computerized methods. He should understand the chemistry of colours, fabric chemicals, and the working systems of the looms. He should plan his designs and indicate threading or drawing-in plan, tie-up of harnesses or heald shafts, punching and lifting plan (sequences) for shed openings, and the working systems of all parts of the loom. And above all he should be familiar with the computer aided design (CAD) and computer aided manufacture (CAM).

When a textile Designer designs for a manufacturer, he gathers information about the product and how and when it will be used. He studies the need and tastes of the consumer to find out what they like and why? The textile designer has two basic

principles as guides to create designs. The first principle is that he must produce functional designs. Equally important he must be equipped with the information of what type of fabric production method will be used for his designs. Generally he must understand production methods and work closely with the textile scientist and technologist. There is no meaningful textile technology without textile design. In order to find acceptable textile fabrics the works of the textile designer and technologists must be united so as to produce worthy fabrics. The design of the traditional woven strip is plain weave that is the order of interlacing of the warp and weft yarn, one warp yarn up and one weft yarn down. This is for the main strip. The finishing of the traditional fabric requires the joining of the strips to make the width of the required cloth. The joining of the strips has to be modified by the researcher so that the woven cloth on the modified loom should look like the already joined strips. This is like putting together the works of many weavers at the same piece of cloth. To achieve this weaving technique the researcher has introduced different weaving techniques to maintain the aesthetic and design qualities of the traditional woven fabric.

The objectives of this study were achieved, because the mechanised modified loom constructed can weave. Out of the thirteen samples woven by the researcher, three of the samples marched the targeted traditional fabrics; they are the Sawaye, Zugu and Turkudi woven fabrics. And from the survey made by the researcher, it was discovered that the narrower the strip the more expensive the fabric becomes.

4.2 SAMPLES WOVEN WITH THE MODIFIED LOOM

The warp yarns were then tied to the cloth beam. The raising and lowering of warps depend on whether it is required to lift the warp end above the weft pick or to keep it

below the weft during the picking operation. Threads run vertically and are held in place by heddles attached to individual moveable shafts. The space created between the shafts is the shed through which the weft threads pass horizontally in the shed with the shuttle. A beater or reed presses the weft yarn into the woven fabric. The two treadles were foot operated pedals that move the shafts of the loom up and down during the weaving operation. This process of creating a shed, placing toilet paper and beating the paper down will make the warp threads become evenly spaced from each other faster than using the weft yarn as heading which is weaving the first few picks. Another shed was made with a new set of threads and more toilet paper was beaten in. This means lifting up a different section of the threads with different shafts. These steps were repeated until the warp yarns were spaced evenly. The first shed was created and the weft yarn was attached to one of the edges of the warps.

The shuttle carrying the weft yarn was passed through the shed. The yarn was allowed to go through the shed at a 45 degrees angle so that enough yarn can be packed on the woven fabric while beating the weft yarn with the reed. The yarn was gently pulled so that only a small amount of give was left at the opposite side. The weft yarn was gently beaten. This is done by pulling the reed of the loom forward until the weft yarn is straight and pressed against the last row on the toilet paper. The shed was then released and you have the first row of the weft yarn for the weaving operation. For the next row of the weft yarn a shed was created with a new set of threads by pressing the second treadle to raise a new shaft and a different set of heddles.



Plate 4.1 Heading with the modified loom

Source: Photographed by M. Y. Waziri (2012)

The principle of weave construction of the plain weave is simple. This is because any two alternate yarns in either the warp or weft interlace in exactly the opposite manner, with every yarn in each series passing alternatively over and under the yarns of the other series as in Plate 3.34. If the first warp of a plain weave is over the first weft, it will be under second over the third, under the fourth over the fifth, and so on. The second warp would then be exactly the opposite.



Plate 4.2: Modified loom in operation

Source: Photographed by Abdullahi (2012)

It takes only two warps and two wefts to make a repeat of the plain weave in a fabric construction. And all the other warps and wefts are the repetition of the first unit repeat of the design as in Plate 4.2.



Plate 4.3: First fabric woven on modified loom

Source: Woven by M. Y. Waziri (2012)

The design used for the first weave on the loom was the plain weave, with a straight draft warp threading, on a four harness floor loom of a factory size. The harnesses were tied to the lams and then to the pedals. The pedals used were two, because there were two different orders of interlacing, that is when the two odd numbers, harnesses one and three were raised, the two even numbers, harnesses two and four were down. And when the two odd numbers, harnesses one and three were down, the two even numbers, harnesses two and four were raised. This completes the unit repeat of the plain weave design draft, the rest of the fabric being a repetition of these four interlacings. Although the loom wove the fabric, it was very thick and rough. The researcher then experimented for the second time to get the fabric in next Plate 3.4.



Plate 4.4: Second weave with the modified loom.

Source: Woven by M. Y. Waziri (2012)

This fabric looked better than the first one but it was too thick for the fabric the researcher wanted to weave. The warp and weft yarns were both machine spun; the warp yarns were breaking due to the fact that they were not sized and this problem was solved by spraying VIJU milk on the warp yarns. This made the second fabric better looking than the first one.

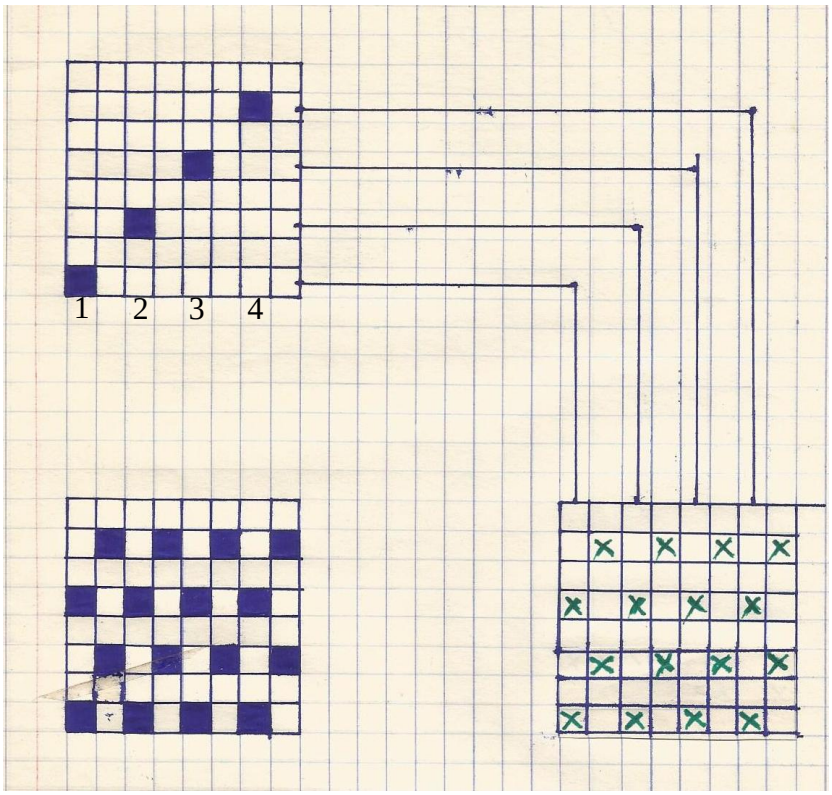


Plate 4.5: Third weave with the modified loom

Source: Woven by M. Y. Waziri (2012)

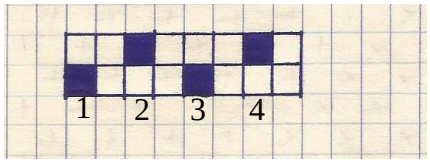
After weaving the second weave draft, hand spun cotton yarn was used for the third weave in Plate 4.5. The fabric was looking like the fabric woven on traditional loom but it was too thick for the fabric the researcher wanted to produce. The next experiment was conducted with the warp yarns threaded alternately in the dents of the reed, preventing the packing of the warp closely to each other during weaving. And the weft yarn was controlled by having a close warped selvage to prevent the packaging of the weft yarns close to each other during weaving. The weaving draft design is illustrated as in Figure 4.11, with the drawing-in-draft, the lifting plan and the reed plan, to produce a loosely woven fabric as in Plate 4.6.

Drawing-in draft (D.I.D)



Weave design Chain-draft (C. D)

3



Reed plan (R.P)

Figure 411: Weave plan for alternate warping.

Source: Drafted by M. Y. Waziri (2012)



Plate 4.6: Fourth weave with the modified loom

Source: Woven by M. Y. Waziri (2012)

The fabric produced in Plate 4.6 above is the result of changing of the weave design draft. The fabric looked loosely woven, and although woven with machine made threads for both warp and weft yarns, the fabric was too thick.The researcher then experimented with thinner hand spun weft yarns on the same altenate warp threads.

The result is the fabric in Plate4.7, and although the weft yarn used was thin hand spun cotton yarn, the fabric was weft faced and still too thick for the desired traditional fabric.
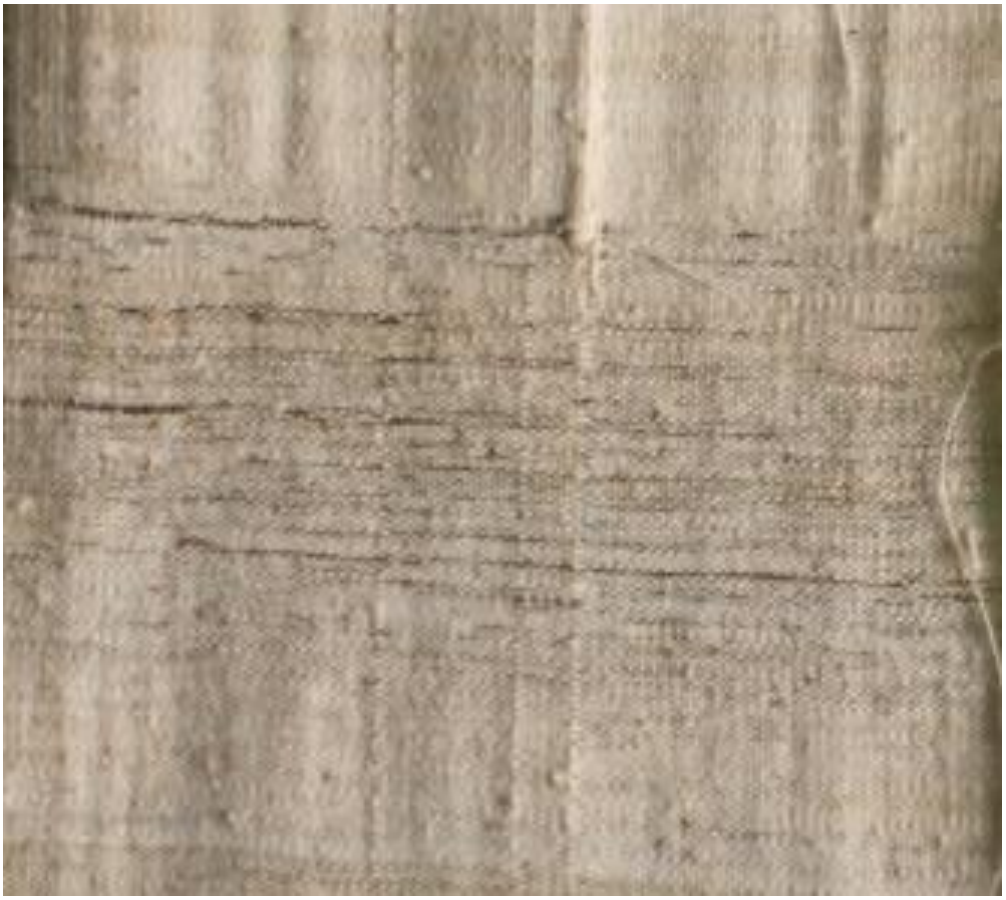


Plate 4.7: Fifth woven design with the modified loom

Source: Woven by M. Y. Waziri (2012)

The fabric produced on alternate warping system could be better looking than the one produced on serial warping. The researcher then experimented with adding extra warp yarns to partition the woven fabric so that it would look like the joined strips of the traditional fabric.



Plate 4.8: Sixth woven with modified loom

Source: Woven by M. Y. Waziri (2012)

The result is the fabric in Plate 4.8 above, and although the fabric showed some lines on the added extra warps, it was still weft faced and still too thick. All the six samples so far produced appeared too thick for the material the researcher was looking for. The warp and weft yarns used were too thick, and second weave was then experimented with thinner weft yarns, using first machine spun yarns and then later the thin hand spun yarns. These two results gave almost the same fabric, both weft faced, because the warp yarns were thicker than weft yarns and beat-up by the reed packs the weft yarns together. The researcher then discovered that the twine threads

used as the heddle strings were too thick. So the heddles were changed to thinner nylon threads as shown in Plate 4.9.



Plate 4.9: Changing the heddle strings

Source: Photographed by Abdullahi (2012)

After changing the heddle strings to thinner nylon threads, the researcher closely observed the traditional woven fabric to be imitated and embarked on the production of the fabric that would look the same. The researcher then got machine spun print cloth weaving yarns that was thin and fine. The warp yarns were prepared on warp frame and transferred to the warp beam and then threaded to the thinner new heddle strings. This was done according to the drawing-in-draft (D.I.D) through the eyes of the heddles and then threaded in to the reed according to the reed plan (R.P). After passing all the warp yarns through the reed, the warp yarns were tied to the cloth beam in front of the weaver. The researcher first used the same warp yarns as weft and the result was not encouraging because of the processes of the loom preparations.

Due to the preparation process the researcher lost some of the warp yarns and the fabric woven was what is on Plate 4.10.



Plate 4.10: Fabric woven on warp yarns same as weft yarn

Source: Woven by M. Y. Waziri (2012)

Although many warp yarns were lost on this particular weave, the researcher then repaired the warps. The result of the repairs was the fabric on Plate 4.11. This fabric was a success because it was almost a perfect plain weave. The only difference between this fabric and the traditional Sawaye type of fabric was the yarns used in its fabric production. The fabric was woven with machine spun yarns for both weft and warp yarns while the Sawaye cloth was made with the traditional hand spun yarns.



Plate 4.11: Broken warp yarns were replaced

Source: Woven by M. Y. Waziri (2012)

From this fabric on Plate 4.11 the researcher then introduced the extra warp yarns with spacing like the Zugu traditional fabric. The result is the fabric on Plate 4.12.



Plate 4.12: Zugu traditional fabric imitation

Source: Woven by M. Y. Waziri (2012)

This fabric was constructed with the machine spun warp yarns and traditional hand spun weft yarns to produce the Zugu type of fabric as in Plate 4.12. The fabric produced was very thick due to the beat-up process which packs the weft yarns closely together and makes the fabric very thick.

With all the problems encountered the researcher went ahead to experiment the weaving of Turkudi cloth. This was done by adding extra warp yarns to Zugu fabric imitation. The result is the woven fabric in Plate 4.13 with the Turkudi cloth appearance.



Plate 4.13: Turkudi loom imitation weave

Source: Woven by M. Y. Waziri (2012)

This is not to say that the fabric was woven without any difficulty. The problems encountered were the breaking of warp yarns from the selvage as in Plate 4.14 and the formation of balls on surface of the warp yarns due to lack of sizing. The warp yarns



Plate 4.14: Turkudi cloth weave-imitation on the loom

Source: Woven by M. Y. Waziri (2012)

were breaking despite the fact that the researcher was allowing a small give of the weft yarn at the selvage edge of each weft insertion. The researcher discovered that the warp yarns though thin enough to resemble the Turkudi cloth, were not strong enough to withstand the vigorous weaving operation on the modified loom. The yarn used for this experiment was one hundred per cent (100%) cotton yarn. Since the result produced was not encouraging, the researcher then experimented with a one hundred per cent (100%) polyester yarn, hoping that the man-made fibre will be stronger than the cotton yarns. The result was at first very encouraging but later became disappointing as shown in Plate 4.15.



Plate 4.15: 100% polyester yarns used as warp yarn

Source: Woven by M. Y. Waziri (2012)

The researcher experimented using both the cotton and the polyester yarns as weft yarn during the weaving operation. The problem of selvage breakage was controlled in this warping preparation as yarns for the selvage were doubled in each dent of the reed threading. The warp yarns were sprayed with Viju milk to size the yarns. This practice of spraying milk to size the warps, also created tension problem during the weaving operation as the extra warps used to demarcate the fabric to appear in strip form was of cotton fibres. The difference in fibre formation of the two yarns when wet, created the difference in elasticity of the two yarns as the polyester yarns stretched more than the cotton yarns. Another problem encountered with the fibres was that despite the spraying to size the yarns, the polyester filaments started to cut and piled on individual yarns forming balls at the back of the loom due to the movement of the heddle shafts and the reed during the weaving operation. This can be seen as illustrated in Plate 4.16.



Plate 4.16: Balls formed on the warps at the back of the loom

Source: Warped by M. Y. Waziri (2012)

The balls formed were parts of broken filaments together with some broken yarns which prevented the opening of the shed from the back of the loom and non completion of the weaving operation due to the warp yarn breakages. The fabric woven was almost the fabric the researcher wanted to weave and the objective of the study. The first part was woven with the polyester yarns and later both machine and hand spun yarns were used. The process of this fabric weaving was repeated, this time with cotton yarns as the warp threads. The selvage yarns breakages during weaving was controlled in last weaving operation, the thickness of the woven fabric was reduced and the extra warp yarns introduced separated the strips as a collection of the traditional Turkudi cloths.

4.3 LIMITATIONS OF THE STUDY

The modified woven samples used for the interview conducted with the respondents in this research were the fabrics woven on the modified loom in Plates 3.11, 3.12 and 3.13. This is because of the limitations the researcher had encountered in the

production of the required traditional fabrics. After weaving the thirteen samples, the researcher embarked on the production of a master piece thinking that with the man made polyester yarns better fabrics could be produced. The warp yarns were warped on warp frame with a length of five metres and partitioned in 42 strips with 14 yarns to a strip for the Turkudi, 21 strips for the Zugu and 7 strips for the Sawaye, if the researcher was successful with weaving in Plates 3.15 and 3.16. The result was disappointing because of the problems encountered with the two types of yarns used. The total length of fabric woven with that preparation was not more than 7 cm before the warp yarns stated to break. This was because the yarns used for the warps were too delicate for the weaving operation conducted with the modified horizontal loom, whence the recommendation that the loom control systems should be improved for a successful imitation of the traditional fabric.

4.4 PRODUCTS OF THE MODIFIED AND UNMODIFIED TRADITIONAL LOOMS

The modified woven samples used for the interview conducted with the respondents in this research were the fabrics woven on the modified loom in Plates 3.11, 3.12 and 3.13 compared with the traditional fabrics acquired during the pilot study.





Plate 4.17: Traditional Sawaye Cloth. **Plate 4.18: Product of the Modified Loom**

Plate 4.18 is the stereotype of Plate 4.17 the traditional Sawaye cloth, woven on the modified loom.

Source: Woven by M. Y. Waziri (2012)





Plate 4.19: Traditional Zugu cloth **Plate 4.20: Product of the modified**

Plate 4.20 is the stereotype of Plate 4.19the traditional Zugu cloth woven on the modified loom.

Source: Woven by M. Y. Waziri (2012).

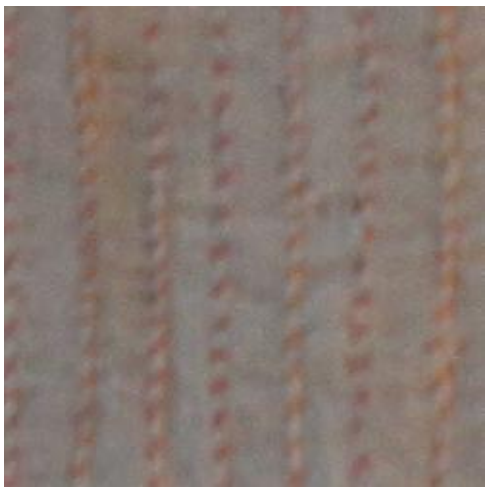


Plate 4.21: Traditional Turkudi Cloth.



Plate 4.22: Product of the Modified Loom.

Plate 4.12is the stereotype of the traditional turkudi cloth Plate 4.11woven on the modified loom. The fabric was woven with machine spun warp yarns and hand spun weft yarns.

Source: Woven by M. Y. Waziri (2012)

4.5 SUMMARY OF THE PRACTICAL WEAVING PROCESSES.

The objectives of this study were successful, because the mechanised modified loom model constructed can weave. Out of the thirteen samples woven by the researcher, three of the samples march the targeted traditional woven fabrics they are the Sawaye, Zugu and Turkudi woven fabrics. The design of the traditional woven strip is plain weave that is the order of interlacing of the warp and weft yarn, one warp yarn up and one weft yarn down. This is for the background of the fabric. The finishing of the fabric required the joining of the strips to make the width of the required cloth. The joining of the strips was modified by the researcher so that the woven cloth on the

modified loom should look like the already joined strips. This is like putting together the works of many weavers at the same piece of cloth. To achieve this weaving technique the researcher introduced different weaving techniques so that the aesthetics and design qualities of the traditional woven fabric would be maintained. There were thirteen different orders of weave patterns woven as samples with the modified loom, before arriving at the required fabric imitations of the Sawaye, Zugu and Turkudi cloths. The researcher found out that the thinner the strip the more valuable and the most expensive it is in the market. The Sawaye cloth is less expensive than Zugu cloth and the Zugu is less expensive than the Turkudi cloth. All those less expensive cloth have wider strips than the expensive ones.

4.6 DATA COLLECTION ON THE WOVEN SAMPLES

The woven samples were taken together with original traditional cloth for the answers of the questionnaires drafted for the interviews conducted by the researcher. The purchased fabrics of the traditional loom products acquired during the pilot study were taken together with the woven samples of the modified loom for comparison.



Plate 4.23: Researcher with turkudi loom weaver

Source: Photographed by Abdullahi (2014

Mallam Mohammadu, the 70 year old weaver said that they were two weavers left, but now he is alone as his partner died not very long time ago. He has no apprentice and may be the last weaver in Moha ward of Kura town. He doesn't use machine made thread, and complained that even the very good hand spinners have disappeared with time, with only two old women left from whom he gets only two supplies from each in a year. He had the same view with the calenderers that machine made yarns will not take up indigo blue in a pit dyeing technique and treatment of the calenderers to give it a shinny effect. To train a youth who will continue with the profession, Mallam Mohammadu asserted that, youths don't have the patience to do the weaving because of the proceeds, and that they have better options than Turkudi weaving. He finally concluded that, almost every year he gets visitors who come and take his

pictures and go away, but none has shown interest in weaving not to talk of replacing his work. He insists that the prestige attached to his weaves cannot be taken by the bulk weaving the researcher wants to make.



Plate 4.24: Kura turkudi market dealers with the researcher

Source: Photographed by Abdullahi (2014)

The Kura market dealers were composed of mostly the traditional weavers, the dyers and calenderers of the traditional Turkudi cloth. On interviewing the marketers about 85% of them strongly agreed that the traditional fabrics are more superior to the fabrics produced on the modified loom. One of them, a 60 year old Alhaji Sani, told me that, since the time of his grandparents Europeans were coming to investigate about traditional weaving but up to now they could not produce fabrics better than the ones they produce. He went on to explain that the narrower the strip the more expensive it becomes because of the time and effort the weaver spends on the production of the woven strip.



Plate 4.25: Researcher with Kura hand spindle and chalk dealers

Source: Photographed by Abdullahi (2014)

For the hand spinning accessories producer, a 60 year old Mohammadu Lawal, the products of the modified loom is more preferable to him. This is because it will be more durable than the traditional fabrics. But he too later stated that, as for prestige the traditional fabrics are more prestigious than the fabrics produced on the modified loom.



Plate 4.26: Researcher with Kura indigo pit dyers

Source: Photographed by Abdullahi (2014)

Indigo pit dyer, a 70 year old Mallam Abba, told the researcher that there were eleven dyeing centres in Kura before now, but all the other centres were closed except this dyeing centre *Babban Marina* and all the other dyeing spaces were either sold to people to build houses or distributed by inheritance and turned to houses. He went on to add that, even this one as you can see, "we are surrounded by houses", there are only four of them remaining, himself Abba 70, Gambo 68, Maraya 67 and their senior brother Saminu who is 80. They use modern dyestuff and chemicals because they could not produce the locally made ones. They have 69 pits left and claim that even their grandparents do not know the original diggers of the pits they are using. They found that since the time of their grandparents, the pits were being renovated by their predecessors, when they come to use them. This has contributed to environmental

hazard as their drinking water was polluted by the chemicals they used over the years. The drinking water in their wells contain these chemicals and even their bore holes, of about 40 to 60 metres deep still contain taste of these chemicals.

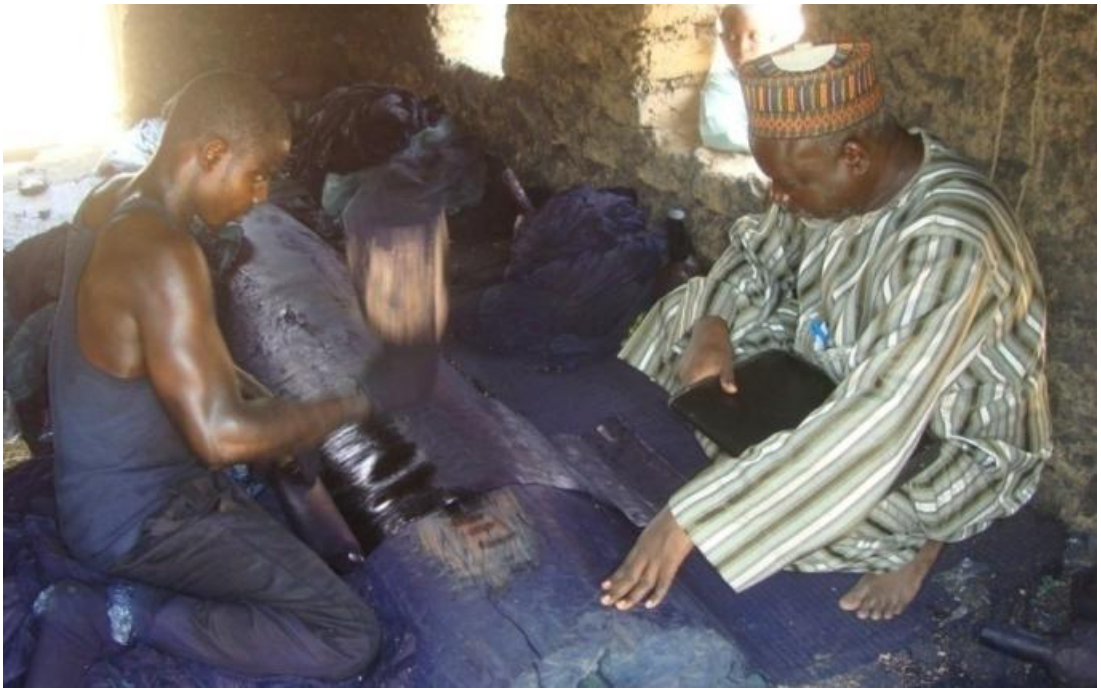


Plate 4.27: Researcher with Kura calenderers of indigo blue Turkudi turbans

Source: Photographed by Abdullahi (2014)

Mallam Abubakar a 28 year old Turkudi veil Calenderer, has finished secondary school and now doing the calendering as part of a living, because he is a round the year farmer, as he does irrigation during the dry season, as well as animal breeding. He said there are nine adult calenderers and three apprentices in their *Babban Mabuga* shed. They use modern dyestuffs and animal fats to apply to already dyed Turkudi turbans before calendering with wooden mallets. After these treatments the animal fat is still added to the mallet while beating. He said he would not calender fabrics with

machine spun yarns because the fabric will not hold the animal fats and the dye stuff applications made on the turbans while calendering.

4.6.1 Summary of Data Collection and Treatment

TABLE 4.1: Summary of the interview and participant observation schedules for the traditional narrow horizontal loom weavers, indigo blue pit dyers, indigo blue calenderers, marketers and users of the narrow horizontal loom woven fabrics.

Respondents	Frequency of distribution	Percentage of distribution	Frequency of return	Percentage of return	Percentage of waste
WEAVERS	6	100%	100%	100%	0
DYERS	9	100%	100%	100%	0
CALENDERERS	12	100%	100%	100%	0
MARKETERS	20	100%	100%	100%	0
USERS	10	100%	100%	100%	0

According to Oguntona (1980), "participatory activities allow accessibility to certain situations and information some not always equally accessible, or not as quickly, to an 'outside researcher." He then added that, "by virtue of participatory activity, the 'inside' researcher is right there where the action is and where people talk about what is happening so as to record true life situations." All those interviewed had cooperated and responded, though some refused to give their names while others refused to give their actual dates of birth. The response the researcher got may be associated with his guide who happens to be Mallam Ashiru, a dealer in the Turkudi veils market who is

familiar with most of the people interviewed. A total of 56 people involved in one way or the other in the traditional methods of production and marketing of the narrow strip cloth were interviewed through questionnaires and participant observation methods of data collection.

Table 4.2: Levels of Western education of the respondents

Individual Groups		Total	%	Primary		Secondary		Tertiary		None	
A	Weavers	6	100%	2	33%	1	17%	0	0%	3	50%
B	Dyers	9	100%	0	0%	0	0%	0	0%	9	100%
C	Calenderers	12	100%	3	25%	3	25%	0	0%	6	50%
D	Marketers	20	100%	4	20%	5	25%	0	0%	11	55%
E	Users	10	100%	3	30%	4	40%	2	20%	1	10%
	Total	57	100%	12	21.6 %	13	21.4 %	2	4%	29	53%

From the summary of the data collected on those interviewed in Table 4.1 on their level of western education, only two users attended tertiary institutions. Some of them stopped at primary level, while others reached the secondary level. Most of them did not attend the western type of education, especially the dyers all of those interviewed 100% of them did not acquire the western type of education.

Table 4.3 Attainment of Islamic education of the respondents

Individual Groups		Respondents		Islamic Education		None	
A	Weavers	6	100%	6	100%	0	0%
B	Dyers	9	100%	9	100%	0	0%
C	Calenderers	12	100%	12	100%	0	0%
D	Marketers	20	100%	20	100%	0	0%
E	Users	10	100%	10	100%	0	0%
	Total	57	100%	57	100%	0	0%

But for the Islamic type of education 100% of all those interviewed from the five groups had acquired the Islamic type of education as shown in Table 4.3 above.

Table 4.4 Inheritance or otherwise of the people interviewed in the various groups under study

Individual Groups		Respondents		Inherited		Solo entrants	
A	Weavers	6	100%	6	100%	0	0%
B	Dyers	9	100%	9	100%	0	0%
C	Calenderers	12	100%	12	100%	0	0%
D	Marketers	20	100%	17	85%	3	15%
E	Users	10	100%	6	60%	4	40%
	Total	57	100%	50	88%	7	12%

All the craftsmen interviewed inherited the craft works from their parents that is the weaving, dying and calendaring. As for the marketers only three of those interviewed did not inherit the trade. As for users six of them inherited the clothes from their parents and the four of them bought the fabrics for their personal use. Both users and marketers expressed that the second-hand traditionally hand woven clothes are more expensive, because they are used occasionally and of a better quality than the newly produced ones. This is because the older fabrics were made with better yarns and more time and care was spent on their production by the already disappearing craftsmen.

Table 4.5 Summary of the ages of those interviewed in the study

	Individual Groups	Total	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
A	Weavers	6	70	50	75	65	40	60														
B	Dyers	9	80	70	68	67	68	50	62	70	80											
C	Calenderers	12	60	65	28	26	24	70	68	65	12	13	14	63								
D	Marketers	20	70	35	50	49	50	60	60	45	50	60	65	50	52	70	68	55	72			
E	Users	10	52	68	57	62	40	60	58	62	65	78										

Amongst those interviewed only three marketers refused to state their ages, and it is only with the calenderers that young boys accept apprenticeship while others state that the boys were discouraged by the proceeds they get from jobs their parents inherited or they found them practicing.

Table 4.6

Hypothesis 0 the Modified loom products are of a better quality than the Indigenous loom products.

	Individual Groups		Very strongly agreed	Strongly agreed	Agreed	Fairly agreed	Not agreed
A	Weavers	6	0	0	0	0	100%
B	Dyers	9	0	0	0	0	100%
C	Calenderers	12	0	0	0	0	100%
D	Marketers	20	0	0	0	10%	90%
E	Users	10	0	0	0	30%	70%
	Total	57	0	0	0	8%	92%

The only weaver left in Moha ward of Kura town, Mallam Mohammadu (a 70 year old man) said he does not use machine-made yarns, and made a complain that even the very good hand spinners are being extinguished with time, there are only two old women left and he gets only two supplies from each in a year. He has the same view with the calenderers that machine spun yarns will not take indigo blue application of pit dyeing techniques and the fabric treatment of the calenderers to give it a shinny effect. This is the reason why all the weavers, the dyers and the calenderers refused to accept the first basic assumption which states that the modified loom products are of a better quality than the horizontal loom products, which is the Hypothesis 0. The two marketers and the three users that accept the hypothesis 0 link their acceptance with durability of the fabric, they too will prefer the traditionally hand woven fabrics for

prestige. All the five groups interviewed a total of 92% of them not agreed with hypothesis 0, only 8% of them fairly agreed with the statement.

Table 4.7

Hypothesis 1 (is the alternative hypothesis) the indigenous loom products are of better quality than the modified loom products.

	Individual Groups		Very strongly agreed	Strongly agreed	Agreed	Fairly agreed	Not agreed
A	Weavers	6	100%	0	0	0	0
B	Dyers	9	100%	0	0	0	0
C	Calenderers	12	100%	0	0	0	0
D	Marketers	20	90%	0	10%	0	0
E	Users	10	70%	0	30%	0	0
	Total	57	460%	0	40%	0	0

Almost all those interviewed very strongly agreed that the traditionally hand woven strips are of better quality than the products of the modified loom. From Table 4.6 all those interviewed a total of 92% of them, very strongly agreed with the statement and only 8% of them fairly agreed because those who preferred the modified loom products were for durability and not prestige.

4.4.3 Data Analysis

The data was put into tables and the tables were converted into the cluster sampling charts for analysis and are presented as follows;

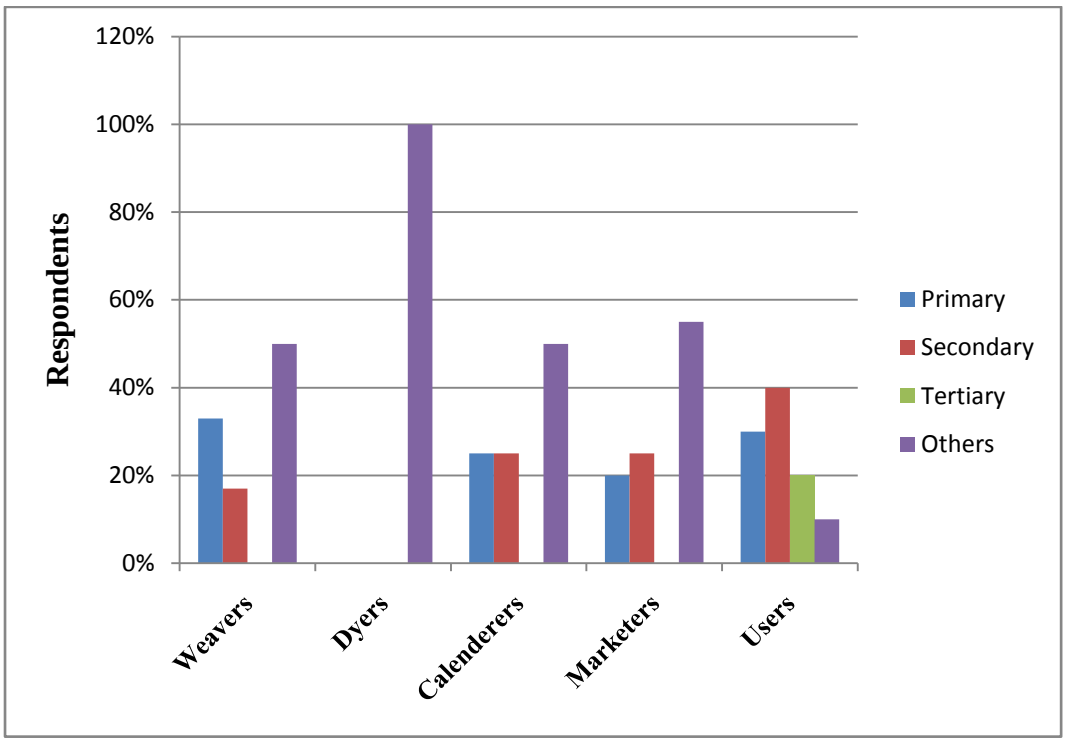


Figure 4.1 Cluster sampling chart of the summary of the levels of Western education of the respondents

The summary of the groups involvement in western education clearly shows that for the weavers 33% of them attended primary school, with only 17% of them proceeded to secondary schools, none of them went to a tertiary institution and the remaining 50% have not attended the western type of education. As for the dyers interviewed none of them attended the western type of education. The calenderers have 25% of them attended primary school only and 25% of them have attained the secondary school level and the remaining 50% have not obtained the western type of education. For the marketers 20% of them have attended the primary school level and 25% of them have reached the secondary school level and 55% of them have not attended the

western type of education. The users are the only ones with the tertiary school attendance with a percentage of 20 while those at primary level in the group constituted 30%, 40% of them have obtained secondary school level and only 10% of them have not attended the western type of education. Figure 4.2 illustrates that most of the people involved in the production and marketing of the narrow strip woven cloth have not attended the western type of education that means they are the local farmers and animal breeders around Kura town and its environs.

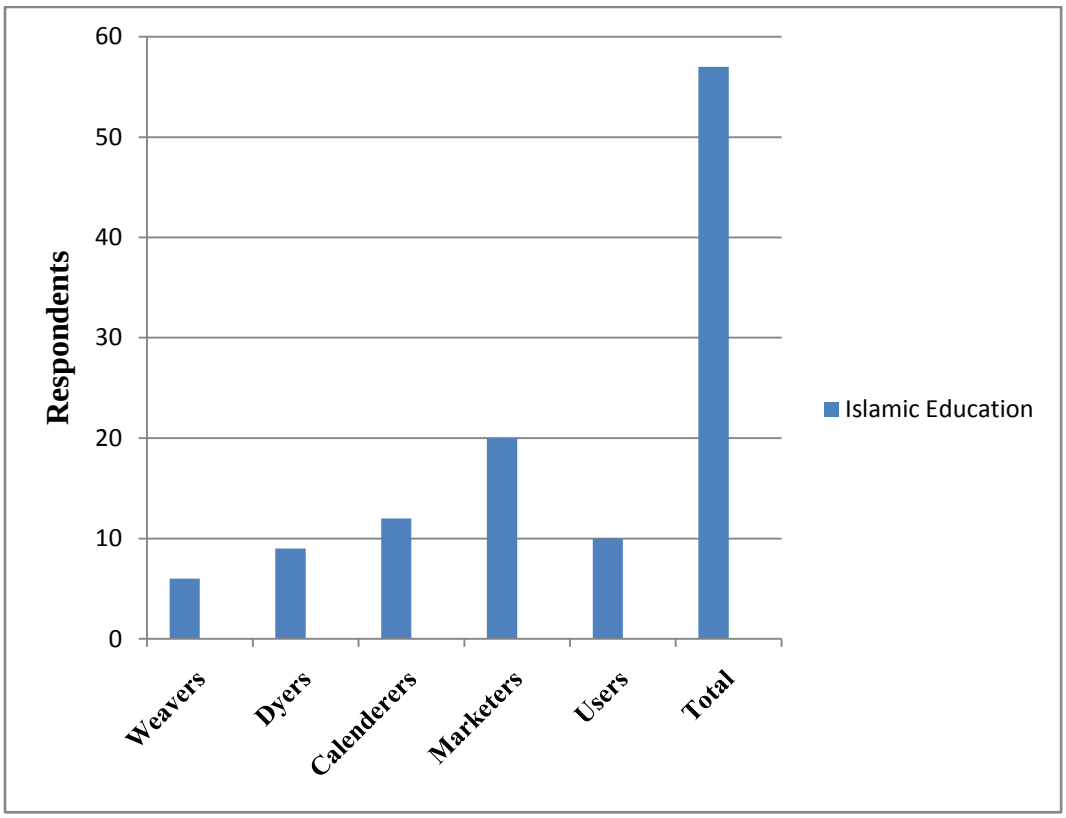


Figure 4.2 Cluster sampling chart of the summary of the attainment of Islamic education of the respondents

As for the Islamic education all the respondents had attended the Islamic type of education right from childhood. Age is an important factor in determining the survival of a craft. If all the craftsmen of a particular group are old men and they have no

apprentice, the survival of that particular craft is in danger as the craft will die off together with the ageing of its practitioners.

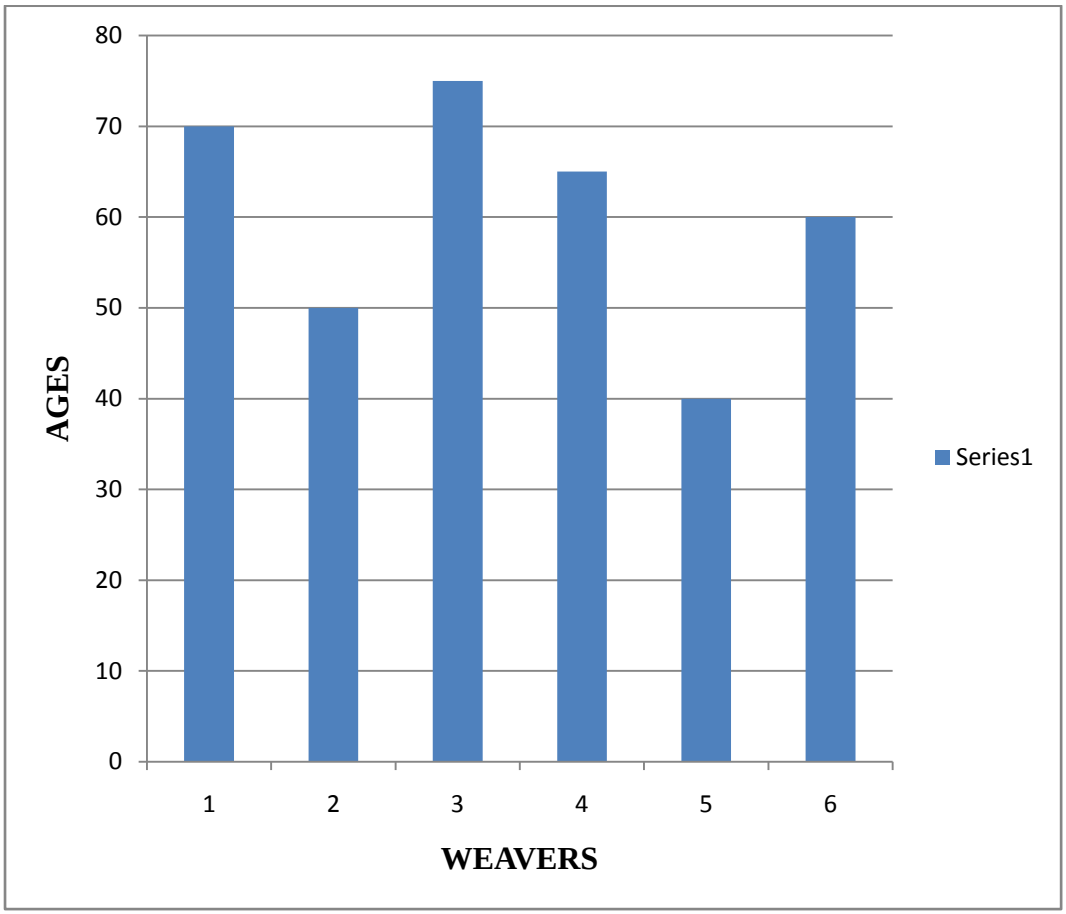


Figure 4.3: Cluster sampling chart of the ages of weavers interviewed in the study.

Apart from number 5 who is 40years old on figure 4.3 all the other weavers are 50 years and above of age and all of them complained of the reluctance of young men to learn the craft as they have other jobs that can make them earn more money than the horizontal loom weaving. They too are only practicing the inheritance systems of

occupations they found their parents practicing, as they have other jobs that will help them to make ends meet.

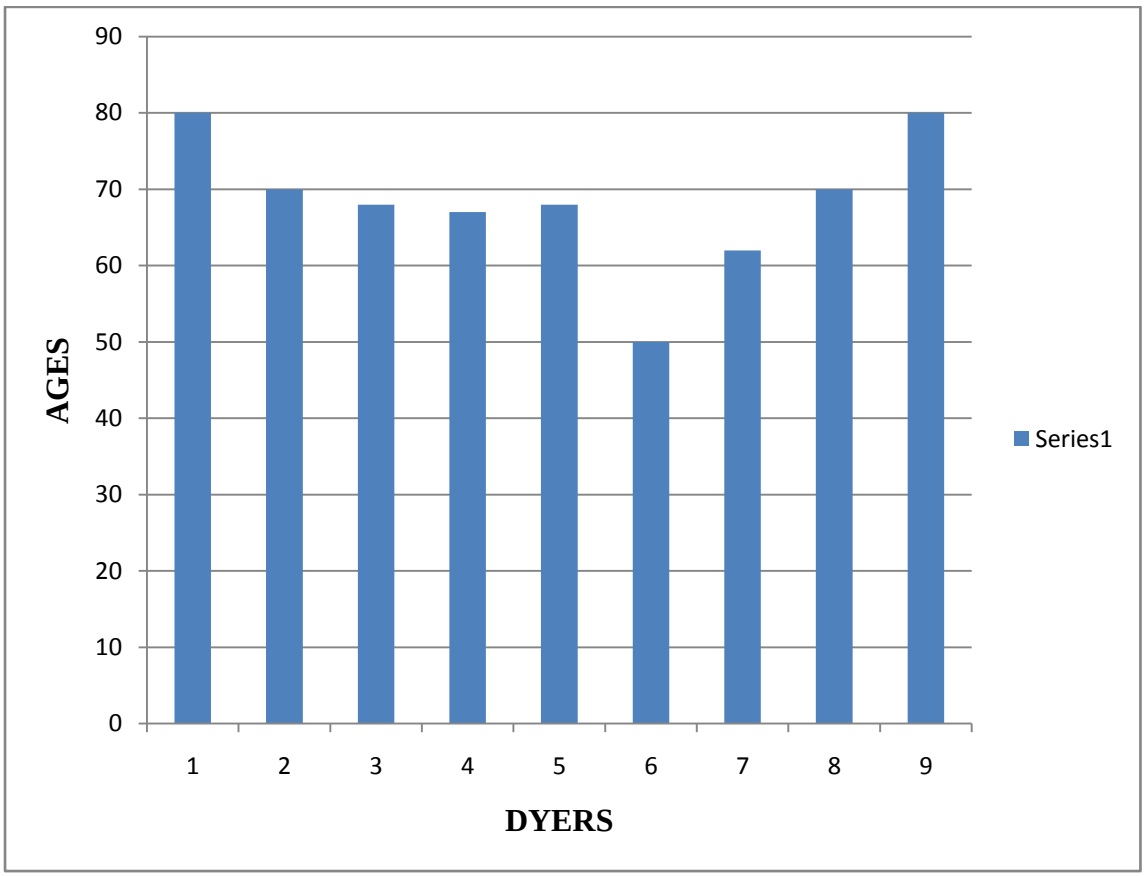


Figure 4.4: Cluster sampling chart of the ages of dyers interviewed in the study.

Indigo pit dyer, a 70 year old Mallam Abba, told the researcher that there were eleven dying centers in Kura before now, but all the other centers were closed except this dying center and all the spaces were either sold to people to build houses or was distributed by inheritance and turned into houses. He went on to add that, even this one as you can see, we are surrounded by houses, they are only four of them remaining, himself Abba 70, Gambo 68, Maraya 67 and their senior brother Saminu who is 80. Most of their youths engage in the farming and animals breeding. Mallam Abba himself wondered what would happen when they are all dead.

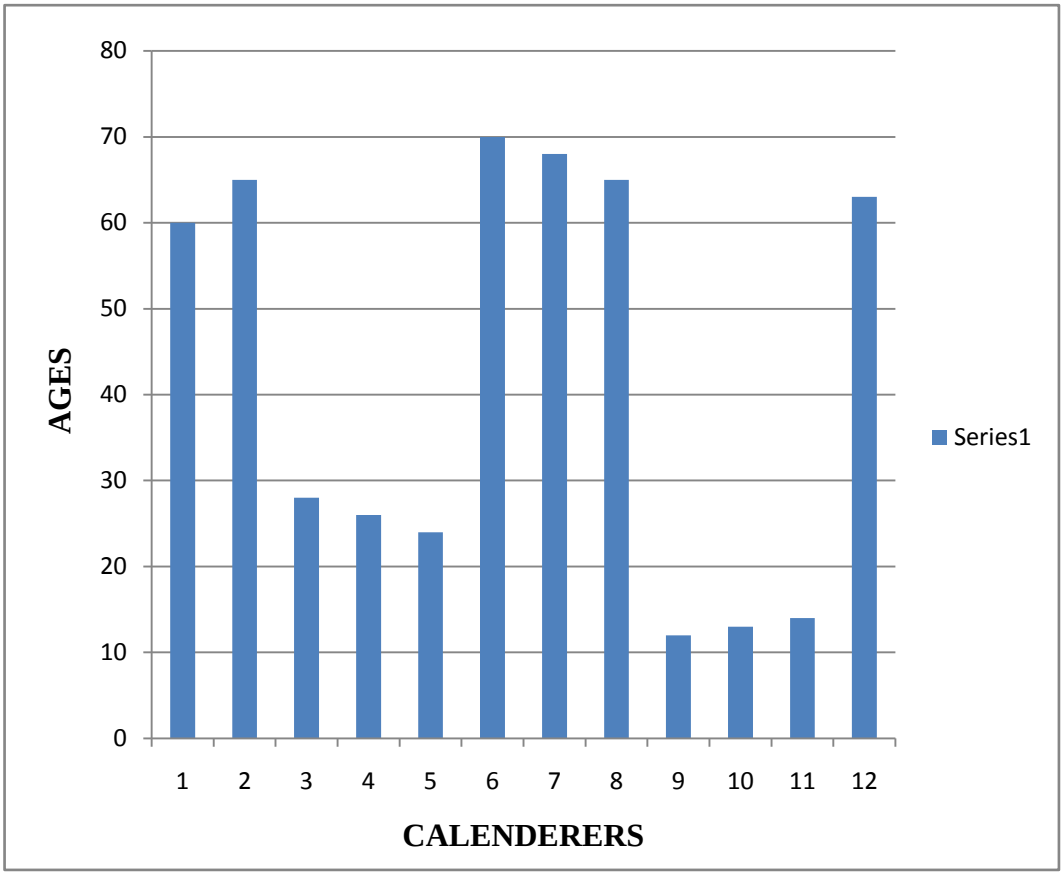


Figure 4.5 Cluster sampling chart of the ages of calenderers interviewed in the study.

As for the calenderers a 28 year old Mallam Abubakar said, he and his two brothers have finished their secondary schools and are now married. They have their farms and animals to breed. They learnt hand woven cloth calendaring profession from their parents and now have three apprentices who are learning the job and are in school.

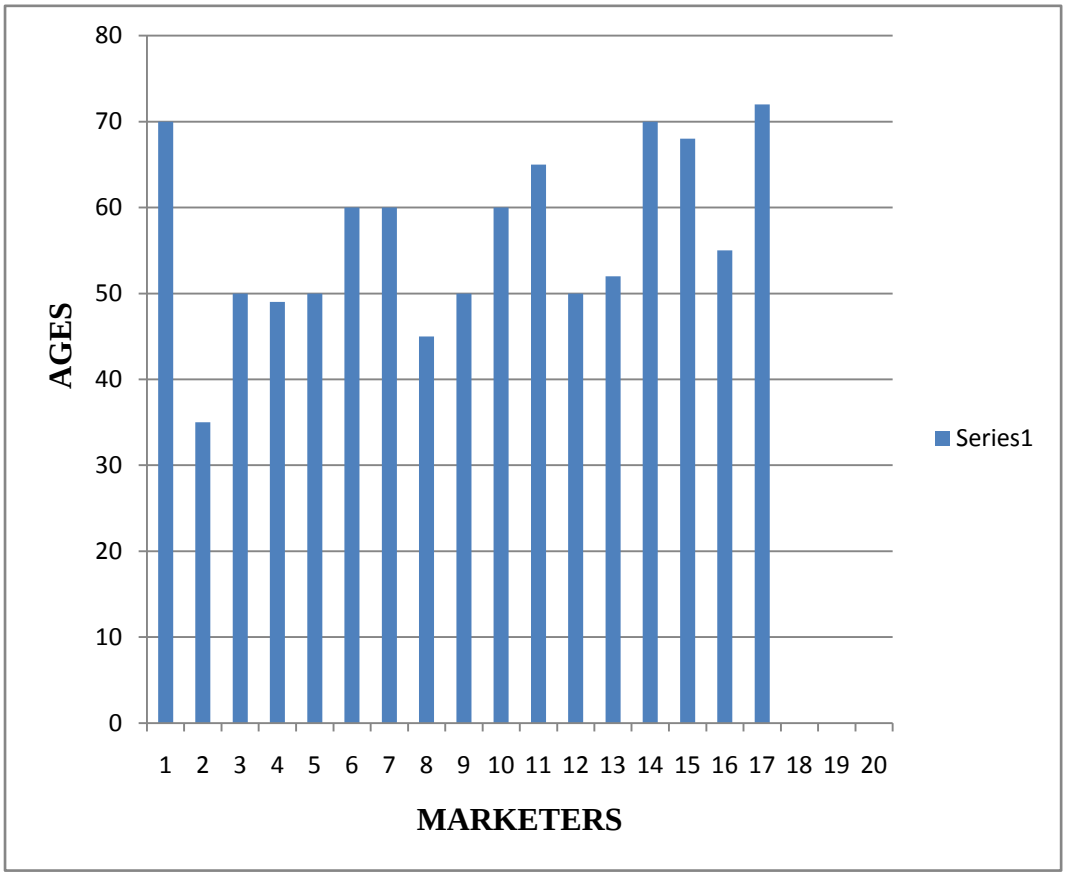


Figure 4.6 Cluster sampling chart of the ages of marketers interviewed in the study.

As for marketers most of those interviewed are old men with three of them below the age of 50 years. The marketers include the weavers, dyers, calenderers and weaving accessories producers who buy and sell both materials and products of the narrow horizontal loom. Some of them are dealers, some are hawkers and there are only three stalls of the hand woven cloths products in the whole Kura market with only one stall fully equipped with the hand woven products. The two others were having the hand woven materials as attachments in their stalls. All the other marketers were hawkers in the market who buy and sell hand woven products.

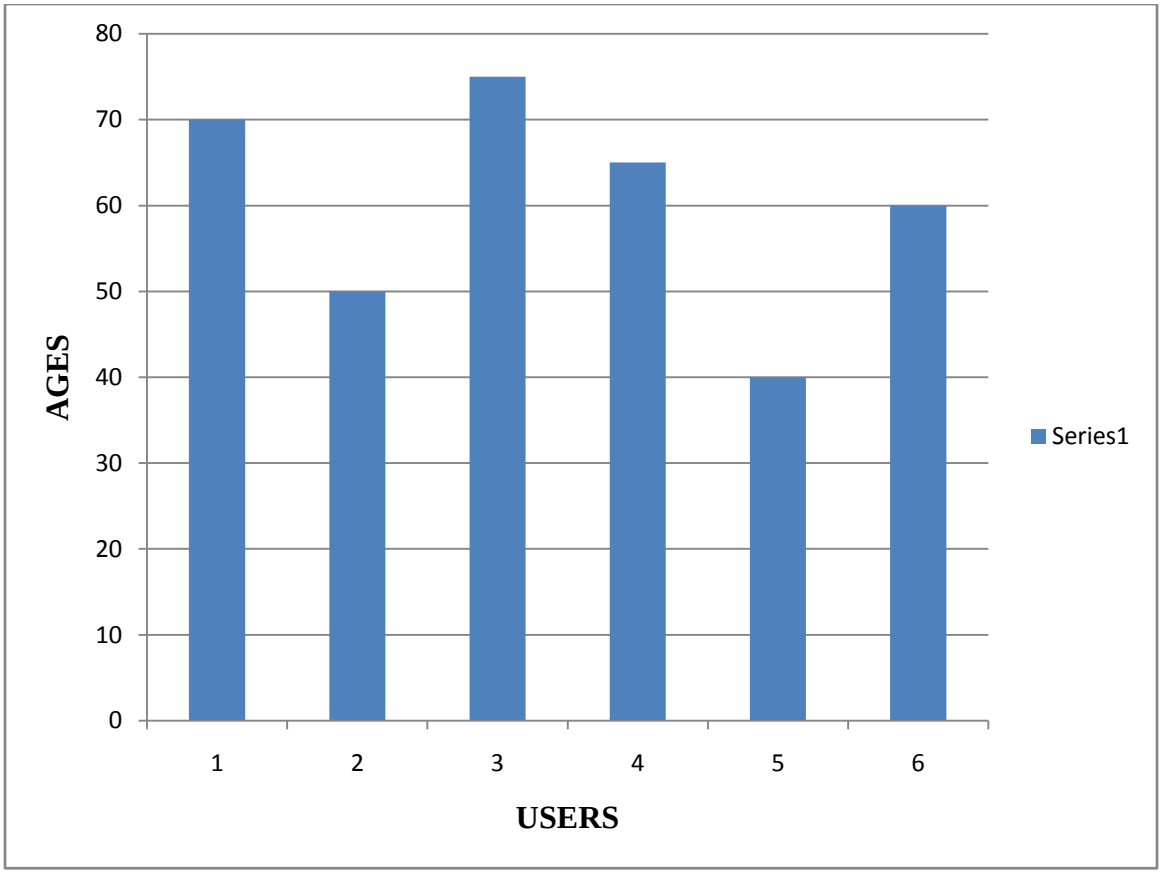


Figure 4.7 Cluster sampling chart of the ages of users interviewed in the study.

The users interviewed were mostly those who inherited the clothes from their parents and the fact that the clothes are expensive shows that only elderly and wealthy can afford to keep or use the inherited clothes. A gown or a turkudi veil inherited or in second hand value will cost not less than one hundred and twenty thousand Nigerian Naira which is equivalent to (718.6 Dollars). That was why only one of them 40years of age the rest are all above 50years one of those interviewed said the second-hand gown he bought is more expensive than the new one, because the older fabric had more time given in the production of both yarns and the weaving process.

After interviewing all the five groups in this study area all the weavers, the dyers and calenderers did not agree with the first basic assumption which states that the Modified loom products are of a better quality than the Indigenous loom products.

Those who fairly agreed were two people from the marketers and three people from the users, they too agreed that the products of the modified loom are stronger in terms of durability but for prestige they too agreed that the traditional fabrics are more preferable to them in terms of prestige. As for the second basic assumption or Alternative hypothesis 1 all those interviewed strongly believed that the traditionally hand woven strips are of better quality than the products of the modified loom. Even those who fairly agreed that the modified loom products were stronger than the traditional loom products also agreed that in terms of prestige they too will prefer the traditional loom products.

Those involved in the trade have all agreed that the trade alone cannot maintained them with their families, they have to combine the trade with farming which they said is the backbone of their lively hood, because of the Hadeja/Jama'are River Basin Development Authority which supplied them with water for irrigation made their farming all the year round and animal breeding easier. These practices, combining rainy season farming with dry season farming and animal breeding have constituted as major factors that helped the local people to maintain their craft works through the inheritance systems. The all year farming and animal breeding have not only prevented the youths from engaging in production and marketing of the narrow strip cloth but also prevented them from attending the western type of education especially the tertiary level. For prestige alone the narrow horizontal strip weaving have survived for a period of over a thousand years of traditional textile manufacture.

4.6 DISCUSSION

Prestige is one aspect of the traditional narrow horizontal loom products that keeps it alive by making the weavers to continue weaving and the users continue to use it, whatever the price of the fabric especially the Turkudi veil. The turkudi veil and especially the narrow Zugu strip that measures less than one inch (2.5cm) in width is acquired by the wealthy for a turban with the Turkudi and a gown with the Zugu. This combination is now difficult even among the rich and only seen with those who receive traditional titles in their areas of birth or those who have contributed in terms of development in an area are honored by the society that benefited from their contributions.

Traditional fabrics woven with different yarns and techniques are not regarded as prestigious as those woven with the hand spun yarns, traditional weaving techniques and with the traditional Turkudi looms. The idea of attaching prestige to the hand woven narrow strip cloth dates back to prehistoric time when cotton woven narrow strip cloth was only worn by royalty and the finer the threads used in weaving and the narrower the strip of cloth woven distinguished the wearer amongst those present at a ceremony. Kings and members of the royal families compete with each other on the fineness of the cloth they wear on occasions. These types of competitions led the emirs to look for the best spinners, the best weavers and the best calenderers around the emirates to make clothes for the emirs with the best fabrics and other members of the royal family with better quality fabrics. The best craftsmen were retained by the rulers in their courts and fabrics produced by them were selected for the ruler first, because he was expected to wear the best clothes among his subjects. These types of attitudes were extended to the populations and those in wealth or authority use the

same methods in acquiring prestigious clothes for themselves and their families. The prestige is attached to the time taken in spinning the yarns, weaving the fabric and finishing the cloth production. This idea of attaching prestige to time spent in fabric production discouraged a lot of youths, even those who found their parents practicing the crafts could not go for the profession because of the proceeds.

In those days when the patrons of the spinners, weavers and calenderers were the rulers and wealthy in the society, the craftsmen were taken care of very well by their patrons who solved all their personal and domestic problems in order to monopolize their productive skills. Those practicing these trades were made comfortable and in fact were being encouraged to produce the best fabric at any cost to impress their patrons and increased their pride when their dressing becomes the best in an occasion.

With the investigation done by the researcher, the results found are that the narrow strip production is going into extinction as most of those handling the trade are old men and they have very few or no apprentices to continue with their inherited skills. The researcher was able to produce the narrow strips types of cloths as stereotype of the traditional fabrics with the modified loom, although not acceptable as the prestigious traditional fabrics but could act as rescue to the disappearing narrow strip cloth production. Stereotypes have preserved so many crafts and their production have helped the distribution of the stereotyped products to reach the less privileged in the society.

4.6.1 Stereotypes of the Woven Traditional Fabrics



Plate 4.28 Traditional turkudi turban



Plate 4.29 Products of the modified loom

Source: Waziri (2012)

These are the products of turkudi loom, plate 4.1 is the original turkudi turban woven with traditional horizontal turkudi loom and plate 4.2 is the stereotype of the turkudi turban woven on the modified loom. Lamb and Holmes (1980) stated that, "the main use of this loom is to produce the cloth for *Turkudi* veils so beloved by the Tuareg, the Teda, various Arab groups in the Sahara and the Moors of Mauritania." They added that, "There appears to be no rural Nigerian demand for *Turkudi*. It has, however, found its way into certain Fulani Court uses and, as such, is marketed in Kano." This is because of the time spent in the production of the narrow strip turkudi veil and the fact that it is considered a treasured item, the cost of this fabric is not within the reach of the well to do Nigerians not to talk of the poor.



Plate 4.30: New Emir of Kano Mohammadu Sanusi holding his court session at Governor's house Kano. (2014).

Source: Daily Trust Newspaper, Wednesday 11 June, 2014.

In the court of the new emir of Kano, there were only four dignitaries wearing the deep indigo blue turbans, two on his right side and two on his left side. The rest are wearing substituted veils including the new emir. Lamb and Holmes (1980) stated that, "the cost of this cloth, even in Nigeria near to its centre of production, is so high that its use is very much in the decline even among the wealthiest peoples." They added that, "In the Sahara the cost of *Turkudi* is almost incredible…….we proposed

to acquire a bundle of four only to find that, even after the most prolonged bargaining we could not lower the price below 100,000.00 CFA Francs for a bundle of four: we had to content ourselves with a single specimen." This was what the researcher experienced at Kura market when the researcher wanted to buy a complete turban of four pieces, but could not because of the cost, so only one piece was purchased at six thousand Naira (6,000.00) for a specimen too. Lamb and Holmes (1980) expressed surprise about the distance between the manufacturers of the Turkudi veil and users of the cloth, when they stated that, "the relationship between Kura, one of the homes of *Turkudi*, and the Tuareg is of great interest. What we see today is a relic of the great age of trans-Saharan trade when merchants from the Kano region could well have had branch offices or associates in Saharan towns like Agades."



Plate 4.31: Tuareg men wearing indigo blue Turkudi turbans

Source: Bing Images; Niger People, Tuareg (2014)

They further stated that, “the Tuareg make a number of uses of *Turkudi* and *shegga*. Its acquisition is a sign of wealth. It is given at weddings and other ceremonies……



Plate 4.32: Tuareg women wearing indigo blue Turkudi head gears

Source: Bing Images; Niger People, Tuareg (2014)

Tuareg women use it for head coverings, shawls and other garments……for the Tuareg it has acquired something of the property of a national dress; and it is a fascinating instance of the conservatism, as well as complexity of life in Western Sudan that a people who occupy territory stretching far north into Algeria should rely on such remote craftsmen as the weavers of places like Kura for garments of this kind.”



Plate 4.33: Fulani girls wearing hand woven head gears

Source: Bing Images; Niger People, Wodaabe (2014).

The Bororo Fulani is another group of people occupying part of the Sahara in Nigeria and Niger, who use *Turkudi*-like strips in their garments. Lamb and Holmes (1980) stated that, "Young men of this group place great value on a very simple sleeveless smock made from this material, again of deepest indigo blue."



Plate 4.34: Young Fulani men wearing sleeveless smocks

Source: Lamb and Holmes (1980)

According to Shea (1979), "some of the output in another Turkudi centre in Hausa, Dal, is used to make up gowns much sought after by the Kanuri in Borno." Lamb and Holmes (1980), posed two questions one is why manufacture so narrow a strip, involving so much labour and expense, when a wider strip will do as well? And the second question is, why is it, only in Hausa land and neighbouring Borno, very much under Hausa influence in this respect, do we find a strip so narrow? They tried to answer them by reporting that, "Traditionally, and until relatively recently, in northern Nigeria and adjacent regions narrow cotton strip, usually carried in tightly rolled wheels, served as money" and added that, "The monetary use of cloth is of great antiquity in this part of Africa. AL Maqrizi, who lived from 1364 to 1442, made the following remarks about Kanem-Borno."

As regards money, they use a kind of cloth which they make and called it

'Wendy'. Each piece is ten cubits long, but for a facility of exchange it is cut up into a quarter of a cubit or smaller. Other substances such as shells of different kinds and pieces of copper or gold are equally in commerce and their value is estimated in an equivalent amount of cloth.

The Shehu of Borno paid his followers with gifts of clothing. Many taxes were collected in the form of cloth; and the proceeds of such taxes were a major source of income for the Shehu.

Another group of people that used cloth as currency is the Mumuye in Taraba State. Apart from its various ritual and ceremonial functions, it is interesting to note that the *langtang* cloth produced by the Mumuye loom in this century still served also as a kind of currency. Lamb and Holmes (1980) added that, "As late as 1920 a *langtang* roll had a trade value equal to about 4 shillings (20 pence, 40 cents, 40 kobo), sufficient to purchase a medium size goat, with a fixed rate of exchange with other currencies in Adamawa such as iron bars and rolls of *bullam* cloth".



Plate 4.35: Rolls of strips cotton fabric

Source: Photographed by M. Y. Waziri (2012)

Lamb and Holmes (1980) added that, "To wear a *riga* of very narrow strip or to cover the face with a veil of *Turkudi* was to make as clear a display of wealth as one finds among other peoples in other continents who wear necklaces or belts of gold of silver coins." They went on to add that, "Given this particular value system, it is not hard to imagine why place of manufacture should be so crucial, materials from other than the traditional sources being, in a sense, counterfeit." Lamb and Holmes (1980) concluded that, "It is not open to doubt that the *turkudi* veil or *shegga* is a very old cloth. ….It could well be that the Hausa *turkudi* industry, still to be seen in active operation in Nigeria today, is over a thousand years old. If so, it must represent one of the longest runs of a textiles fashion in human history." Although the fabrics produced by the modified loom are the imitations of the traditional fabrics, the same approach is used by the Chinese textiles manufacturers where the original Ghanaian Kente hand woven cloth was imitated and reproduced on printed fabrics.



Plate 4.36: Woven Kente cloth

Source: Bing Images; Ghanaian Kente cloth (2014)

Another aspect of a treasured item that is successfully stereotyped is the original gold metal whose value is used to measure the strength of world currencies. The gold metal although not stronger than stainless steel and the fact that some other metals like bronze, copper and brass could give the same colour when combined their value cannot be compared with gold. The same conservative approach is applied to the *turkudi* veil among other hand woven horizontal loom products.

4.7 DEVELOPMENT OF THE WEAVING LOOM

The modified horizontal loom is supposed to increase production output and efficiency of the traditional narrow strip weaving techniques so that the traditional weaver survives in the present Nigerian industrialization. Most of the weavers interviewed were of the view that their traditional fabrics are more superior to the products of the modified loom. Some of them agreed that they prefer their traditional looms to the modified loom. This is not surprising because traditional weavers for centuries and all over the world resisted change and in fact some of them reacted violently to changes.

Brostaff (1978) stated that, "the introduction of flying shuttle loom by John Kay in 1773 brought a great innovation in weaving technology. John Kay lived from 1704 until about 1774 and died in poverty. Modifications of his inventions are still in use to this day. But most of his and his son's innovations were initially rejected by the weaving industry. Hand weavers burnt Kay's living quarters and destroyed his inventions as, 'very dangerous pieces of furniture'." This type of reaction is not only for Kay alone, but even Joseph Marie Jacquard too had to leave Lyon his home town

and went into hiding for tensions to cool down, because of the exhibition of his invention in Paris in 1801 that is the Jacquard head-motion. The head-motion had replaced the Draw-loom and Draw-boy of hand weavers, of the elaborate fabric production. One machine took the place of 100 hand weavers and there were riots in many textile centers.

According to Gilroy (1844), "like many other great inventions, the progress of this machine was not near so rapid as it merit, might have led us to suppose" when he was referring to the Jacquard head-motion. He gave the reasons for the slow progress of the machine, "the first of which was the opposition by weavers who feared that they may be thrown out of their jobs; the second was the imperfection of some of the machine's movements." Rothstein (1977), also reported that, "the Jacquard machine should have come into immediate use but so many were its advantages. In fact, it took at least ten years before the loom was accepted commercially in Lyon," where the Jacquard head was invented. She added that, "35 years after the Jacquard's Paris exhibition of 1801, even Britain, which was regarded as the home of industrial revolution, found it difficult to accept this useful invention."



Plate 4.37: Original Jacquard loom

Source: Bing Images (2014)

Backer (2012) stated that, according to the Lowell National Historical Park Handbook, for the first two centuries of American history, the weaving of cloth was a cottage industry, even after the introduction of power spinning frames in 1790. Yarn

produced by machines in water-powered factories was still put out for weaving on hand looms in homes. All cloths were woven in basically the same way, although weavers followed patterns to produce cloths with intricate weaves. Because the operations of a loom focus on such a small working area, its movements must be exact. And weaving, as opposed to spinning, requires a cycle of sequential steps and involves reciprocal movement as well as circular. In a power loom, movements coordinated by human hand and eye have to be replicated through the precise interaction of levers, cams, gears, and springs. For these reasons, weaving was the last step in textile production to be mechanized.

According to Backer (2012), "Successful power looms were in operation in England by the early 1800s, but those made in America was inadequate. Francis Cabot Lowell realized that for the United States to develop a practical power loom, it would have to borrow British technology. While visiting English textile mills, he memorized the workings of their power looms. Upon his return, he recruited master mechanic Paul Moody to help him recreate and develop what he had seen. They succeeded in adapting the British design, and the machine shop established at the Waltham mills by Lowell and Moody continued to make improvements in the loom. With the introduction of a dependable power loom, weaving could keep up with spinning, and the American textile industry was underway." If the British knew his intentions they wouldn't have allowed him to copy their technology at that time because it was their business secrets.

Backer (2012) stated that, "The mechanization movement, which began in the Industrial Revolution, had a significant impact on how people worked. The next great change in the organization of work occurred as a result of the development of scientific management and the assembly line." For mass production of the modified

loom according to assembly line method of production, will help reduce the production cost of the loom for use as teaching aids to educational institutions where weaving is offered as a course, to the traditional weaver and to the general public. Backer (2012) added that, “The assembly line illustrates the fundamental principles of mechanization: standardization, continuity, constraint, and the reduction of work to simple labor. Taken together, these principles form the core of industrial culture in the mid 20th century in the United States. Also, these fundamental principles form the basis of the "American production system," which until recently, was the undisputed leader in global manufacturing.” If different parts of the modified loom are produced in large quantities and assembled with the principle of assembly line method of production, the modified loom could not only weave the required dress fabrics but furnishing fabrics as well.

4.7.1 Standardization of Parts to Reduce Production Costs.

According to Giedion (1948), the development of precision machining was critical to mechanization. Precise machining guaranteed that the parts of an assembled product would fit together. Also, the precise standards allowed the production of interchangeable parts----this development is fundamental to the modern industrial system of manufacturing. Mass marketing to the consumer depends on interchangeability. Once parts are standardized, they can be used in the assembly stage of production”. If the modified loom’s parts are standardized, there will be less time in assembling a loom and the cost of production will be greatly reduced.

According to Spalding (1890), “The gun-maker's tools were carried to the sewing machine manufactory, but as the demand grew for a better quality of work these tools were improved until we find the sewing machine now in possession of the improved

milling machine, the perfected screw machine, the turrent lathe, a complete system of 'jig' working, and a system of measuring by decimals...Gauge work is an outgrowth from a rude system that originated in the armories, but has been perfected and systematized in the sewing machine manufactory." It is with this technique the LECLERC hand weaving loom has its parts standardized and reproduced in large quantities that can be packed and delivered through-out the world within two weeks of request if ordered as in Plate 4.31 on page 122. The Leclerc loom manufacturers have now developed their looms and have computerized it as in Plates 4.29 and 4.30 on pages 120 and 121, so that the loom can be automated. They have developed and computerized the weaving system in such a way that gears, cams and shafts systems was replaced by electricity cables that control the loom in the weaving operation. According to Leclerc loom manufacturers (2014), "In designing the Weavebird, great effort was made to simplify the mechanism to minimize what can go wrong and to minimize the task involved to get the loom back working if things do. Rather than the complex system of gears, springs, motors and levers found on other earlier Computer-Dobby loom designs, the Weavebird employs a simple closed cable system to raise and lower each harness. With this design, the only real adjustment the weaver may have to make to the loom is to adjust the length and tension of the cables. This is found in a loom that requires very little or no maintenance over the years."

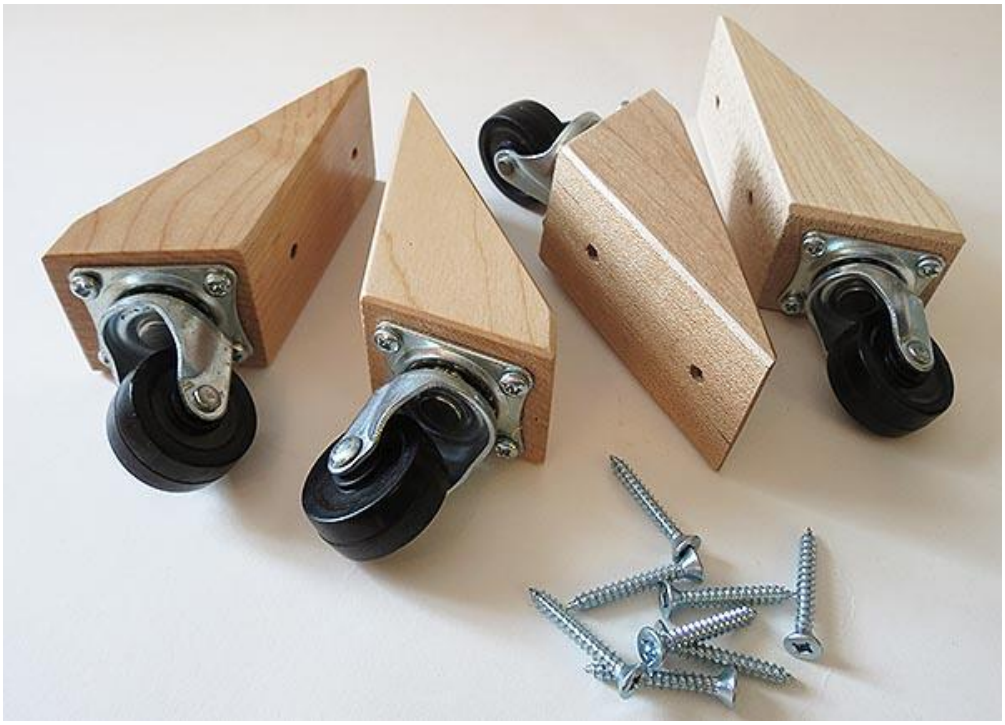


Plate 4.38: Standardized parts of a loom

Source: Bing Images 2014



Plate 4.39 Weave-bird Source: Bing Images; Leclerc Weave-bird (2014)

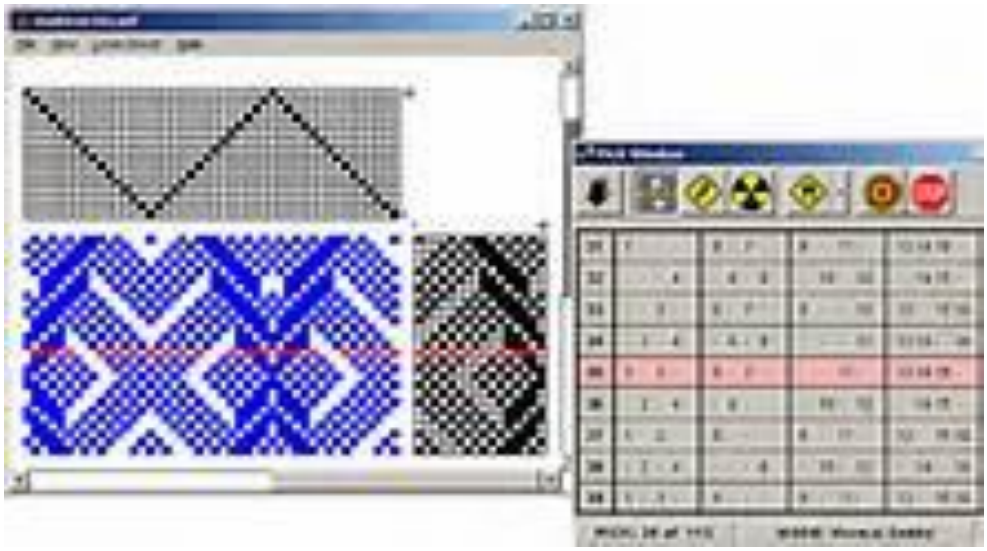


Plate 4.40 Loom Controller

Source: Bing Images (2014)

Hirschhorn (1984) stated that, “Henry Ford was the most successful of the early car manufacturers in the United States. He was born on a Michigan farm in 1863; and, because of this background, he had a life-long aversion to the drudgery of farm labor. Ford was a tinkerer and, while an engineer at Detroit’s’ Edison Illuminating Company in 1896, he built his first automobile. After two unsuccessful attempts to produce an automobile commercially, Ford gained his success with the foundation of the Ford Motor Company, begun in 1903. Ford was committed to producing low cost cars----in this regard, he was different from his competitors who focused on building higher priced cars for the more limited luxury market. The Model T, his most famous car, was introduced in 1908 for under $900. His advertising for the car was correct and showcased its popularity----"No car under $2,000 offers more, and no car over $2,000 offers more except the trimmings. Because of his use of mass production techniques to build the Model T, Ford was able to reduce the price of it to $345 for the runabout and $360 for the touring car in 1916.”

The researcher is of the opinion that, if the Model T, type of mass production is employed in the production of the mechanised modified loom parts, the production cost will be greatly reduced and it could be affordable by the local traditional weaver, the institutions that offer weaving as a course and the society at large.



Plate 4.41: Leclerc Loom Stores

Source: Bing Images 2014

Flink (1981) stated that, "Henry Ford was not the first to use the assembly line-----that credit belong to England, Brunel, and its shipbuilding industry-----however, Henry Ford took the idea of the assembly line and transformed it so that it became a major component of the American industrial system. Ford's use of the assembly line to produce the Model T was revolutionary because "it brought the principles of conveyance and controlled movement to a metal-based industry where the problems

of standardized parts and steady power had first to be solved." Flink (1981) added that, "Every piece of work in the shop moves. It may move on hooks or overhead chains going to assembly in the exact order in which the parts are required; it may travel on a moving platform; or it may go by gravity, but the point is that there is no lifting or trucking of anything than materials."

According to Nuwer (1988), "the introduction of mass production techniques into the workplace was often related to the large amount of machine-tending jobs. Technological changes in manufacturing practices, such as mass production and the assembly line, increased the scale of production of goods by standardizing productive operations. This created a large class of machine operators in American factories who, overall, had lower skills than the craft production workers that were displaced." Nuwer (1988) further stated that,

"The assembly line and its derivatives are still a significant force in the manufacturing world of today. Now called traditional manufacturing, the system of melding worker to the machine is used to build almost all durable goods. And, the development of hierarchy and planning, For example, in the textile industry, machines almost immediately created a sequential manufacturing process that was characteristic of that industry. In iron manufacturing, however, a standard factory layout, because of the new machines, took a long time to develop and there was little uniformity in factory organization until the end of the 19th century. By the 1850s, the system of interchangeable parts combined with specialized machines was being referred to as the "American system" of manufacturing.

Flink (1981), "Ford, when he started, redesigned the factory layout in order to allow for the volume production of cars. He put a great emphasis on designing machine

tools that would increase output. By 1914, about 15,000 new machines had been installed in the Highland Park plant. Ford engineers used time-and-motion studies to install continuous conveyor belts to bring materials to the assembly lines. By the summer of 1913, three subassemblies (magnetos, motors, and transmissions) were assembled on moving lines. Because these moving lines produced subassemblies faster than the main production line could take them, a moving chassis line was added--this reduced the chassis assembly time from 12 1/2 hours in October to 2 hours, 40 minutes in December, 1913."

According to Sankar (2009), "Modern industrial looms are improved versions of the 18th and early 19th century power looms. They weave much faster and with less wasted energy. Whereas early power looms could insert hundreds of picks per minute, modern looms insert thousands per minute----They no longer use shuttles: the weft is propelled by air or water. Modern looms can be connected to computers that control the sheds, to create extremely complex weaves. Even dobby weavers insert avail them of computer technology attached to their looms." Sankar (2012), "the latest weaving machinery is superior in standards of versatility, operating stability, and they consistently provide maximum performance provided the process management is to the best level. In the modern weaving sector, Quick Style Change (QSC) is offered by the loom manufacturer in most of the cases. The main objective in this kind of process is that, to prepare a module outside the weave room so that it can be replaced for the module in the loom after it empties in shortest time possible".

4.8 RESEARCH AND DEVELOPMENT. (R&D)

According to Wikipedia (2013), "The research and development (R&D, also called research and technical development or research and technological development, RTD in Europe) is a specific group of activities within a business. The activities that are classified as R&D differ from company to company, but there are two primary models. In one model, the primary function of an R&D group is to develop new products; in the other model, the primary function of an R&D group is to discover and create new knowledge about scientific and technological topics for the purpose of uncovering and enabling development of valuable new products, processes, and services."

According to Wise GEEK (2014), "Research and Development, better known as R&D, plays a major part in advancing technology in nearly every type of industrial pursuit. R&D systems are organizations that may be private or public, part of a company or separate entities that perform guided experimentation geared toward inventing or discovering new ideas and finding practical means of application. R&D systems are common in electronics, bio-medics, and pharmaceuticals, but may also be used to study consumer or financial trends." Wise GEEK (2014) added that "Technology moves exceedingly fast, especially at the commercial level. Companies that have produced one innovative product, such as a computer, must put out more and more advanced versions of the product in order to keep a constant flow of business. R&D systems are often the means used to keep up with consumer demand for improvements; by constantly testing new theories, creating improved designs, and trying new techniques, R&D systems can help fuel the next generation of nearly every available product." Wise GEEK (2014) finally concluded that, "New product design

and development is more often than not a crucial factor in the survival of a company. In an industry that is changing fast, firms must continually revise their design and range of products. This is necessary due to continuous technology change and development as well as other competitors and the changing preference of customers. Without an R&D program, a firm must rely on strategic alliances, acquisitions, and networks to tap into the innovations of others."

In 1984 International Textiles machinery Exhibition (ITME) held in Germany, two World re-known weaving looms manufacturers Sulzer and Ruti, experienced low sales in their loom's exhibitions because they could not produce at that exhibition better looms than the ones their customers already installed in their industries in terms of technical proficiency and production output. So those who already installed their machineries could not go for any replacement because the manufacturers individually produced looms could draw between 700mpm for the ones installed to 900 meters per minute for the ones exhibited in 1984. The two companies had to come together to share their business secrets and the result was the Sulzer-Ruti machine capable of draw weft yarn at a speed of 1350 meters per minute this co-operation revolutionized their sales in the following exhibition. According to Mehta (1985) "the rapid growth of the textile industry in India in the first of this century was largely due to the "Swadeshi Movement" inspired by Mahatma Gandhi, which stressed the importance of self-reliance. There has been a considerable boost in activity in the textile machinery, having imbibed all types of technologies from almost all the developed countries." From the modified loom of the researcher the Indians were able to develop and improve the machinery manufacture from the manual floor loom to an automatic weaving machine through Research and Development (R&D) in the following order.

4.8.1 Development of the Weaving Loom in India

A single phase electrical motor was fitted to the treadle ratt replacing the pedal for achieving higher output there by producing a 4 shaft semi-automatic loom.

1. In the year 1990-91, a 4 shaft semi-automatic loom was developed and operationalized.

2. In 1991-92, a single phase electric motor was fitted to the treadle ratt replacing the pedal for achieving higher output.



Plate 4.42: Semi-automatic loom

Source: Indian Textile Journal 2012

3.1993-94, the fabrication of a 4 meter power loom by MERADO and the fabrication of a semi-automatic mat loom was in progress.

4. 1994-95, Fabrication of some components such as clutch pulley assembly with shaft, picking shaft fixing machine, sley race and sley filling gear box with side

brackets for a 2 meter matting loom.

5. 1995-96, fabrication of the 2 meter power loom was completed and the design was sold to exporters.

6. 1996-97, operationalised the fully indigenous 2 meter power loom and designed a tappet for weaving dot matting on the semi- automatic loom.

7.1999-2000, the 2 meter power loom developed by CCRI was put to intensive production trial. A training programme for 33 candidates in repair and maintenance of processing machineries was launched for a duration of 45 days.

With this background the manufacture of shuttles weaving machines commenced in India, with the following four companies licensed to manufacture these machines in collaboration with foreign partners.

1. Lakshmi Automatic Looms Works Ltd (LAL), India, in collaboration with Sulzer Brothers of Switzerland were to produce Air Jet Weaving Machines. And Rapier looms in collaboration with Jean Gusken of Germany.

2. Central India Machines Manufacturing Company Ltd (CIMMCO), Gwalior, India, in collaboration with Lindeuer Dornier of Germany, manufactures conventional, ordinary, semi-automatic and automatic looms.

3. Harish Textile Engineers, Bombay, (HARISH), India, in collaboration with Palytechnica of Czechoslovakia, manufactures cloth processing equipment besides Shuttless Weaving Machines.

4. Loyal Machine Works Ltd, Coimbatore, India, had developed their Air Jet Machines through indigenous sources.

According to, Sankar (2009), "Production and Quality are the two main things that any textile manufacturer has to keep up with. Starting from handlooms to the shuttle-

less looms used today, there have been a lot of innovations in the weaving machine". The inherent problem of the shuttle mechanism was discovered and this led to the latest shuttle-less technologies like rapier, projectile, and fluid jet. We could see that the newer weaving machinery is simple in design, motions are more reliable, and consume lesser energy and ultimately have lower maintenance costs. The shuttle-less machines installed today in the weaving sector is not complex and machinery manufacturers 'have drastically simplified the machine construction for the easy maintenance of the customer'. Sankar also stated that, "For instance, SOMET APLHA PGA does not have a break/clutch mechanism and instead they have direct drive motor for the machine start-up and you definitely need not worry about the fabric quality, thanks to the higher pick-up during start-up in the weaving drive motor. This is possible due to the greater precision in the mechanical couplings used on the weaving machines, a real proof of good mechanics".



Plate 4.43: Automatic weaving loom

Source: Indian Textile Journal 2012

This study believes that if the Indian method is to be followed, success is in the pipeline. The textile engineers, textile scientists and textile designers should come together under one textile institute and have a fully automated weaving loom. In the International scenario the use of electronics on Shuttle-less Weaving Machines has not only eased the operation of weavers but has simplified supervision and maintenance and also provided transformations process automation. Shuttle-less Weaving Machines installed in a shed can communicate to a centralized data collection and process monitoring system and get feed-back from the transformations working to achieve maximum corporate benefit. Systems are available to load fabric designs onto the Jacquards equipped on looms, from a central computer control system. Looms can be monitored for production scheduling and necessary instructions

issued for changes on the screen board. According to Booria (2012), "Production Planning and Control technique can be exercised on the complete weaving shed through computerized transformations control system. The Booria CAD/CAM Systems are developed to use their loom controller from Microsoft Windows XP Embedded. The **Booria CAN-Bus PCI Card** and **Selection Box Controller Hardware** will boost the production speed. The solid framework of industrial CAN-Bus network mode A/B and advanced data-link layer error correction help to optimize the performance up to 1Mbps or 6000 picks per minute".

According to Executive Summary (2012) of India in the field of development of textile manufacture, "International manufactures spend 4.5 to 6% of the sales turnover on R&D activities. Concerted efforts are made to increase the versatility and productivity of the looms in absolutely reliable conditions. The thrust is on achieving higher speeds, precise control of the machines, increase automation and reduction in waste and down-time. The R&D efforts are also aimed at attaining 'Total Management System' through electronic monitoring on individual looms by means of feed-back instructions and controls."

4.9 SUMMARY OF THE FIRST BASIC ASSUMPTION OR THE HYPOTHESIS 0 REJECTED BY THE STUDY

After interviewing all the five groups in this study area all the weavers, the dyers and calenderers did not agree with the first basic assumption which states that the Modified loom products are of better quality than the Indigenous loom products. Those who fairly agreed were two people from the marketers and three people from the users, they too agreed that the products of the modified loom are stronger in terms

of durability but for prestige they too agreed that the traditional fabrics are more preferable to them in terms of prestige, as in Figure 4.8 below. With this hypothesis 0 or the first basic assumption testing of the modified loom products of having better quality than the indigenous loom products is false. This is because 92% of the respondents did not agree with the statement, only 8% fairly agreed. The researcher had to reject the hypothesis 0 based on the results gotten from the respondents thereby committing a type II error.

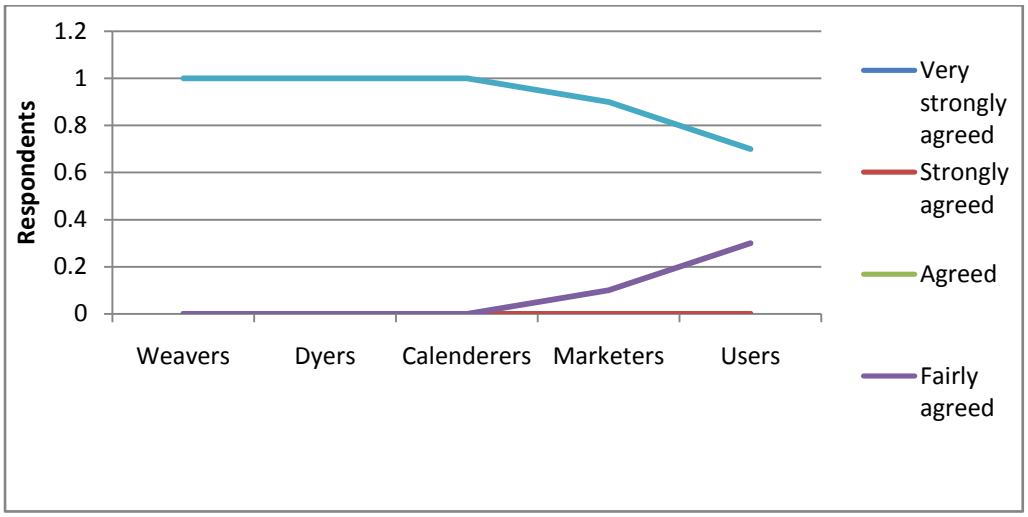


Figure 4.8: Summary of the first basic assumption or null hypothesis rejected by the study

4.10 SUMMARY OF THE SECOND BASIC ASSUMPTION OR ALTERNATIVE HYPOTHESIS 1 ACCEPTED BY THE STUDY

As for the second basic assumption or Alternative hypothesis 1 all those interviewed strongly believed that the traditionally hand woven stripes are of better quality than the products of the modified loom. Even those who fairly agreed that the modified loom products were stronger than the traditional loom products also agreed that in terms of prestige they too will prefer the traditional loom products as stated in Figure

4.9 below. The basic assumption 2 or hypothesis1 that is the traditionally hand woven strips are of better quality than the products of the modified loom is true. This is because 92% of the respondents very strongly agreed with the statement, and the remaining 8% also agreed. The alternative hypothesis1was accepted by the researcher based on the results gotten from the respondents thereby committing a type I error.

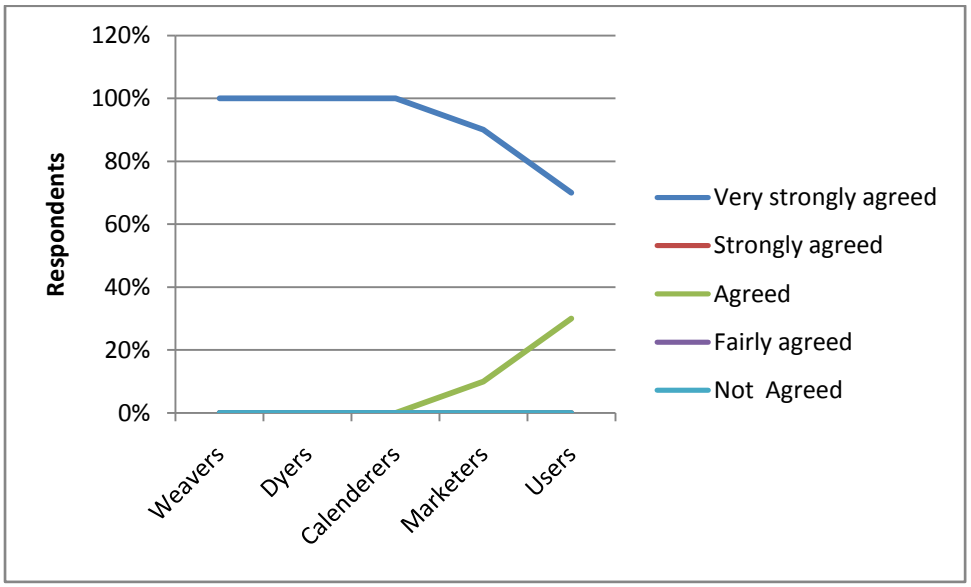


Figure 4.9: Summary of the Second Basic Assumption or Alternative Hypothesis 1 accepted by the Study.

4.11: SUMMARY OF THE FIRST BASIC ASSUMPTION OR NULL HYPOTHESIS 0 REJECTED BY THE STUDY AND SECOND BASIC ASSUMPTION OR THE ALTERNATIVE HYPOTHESIS 1 ACCEPTED BY THE STUDY

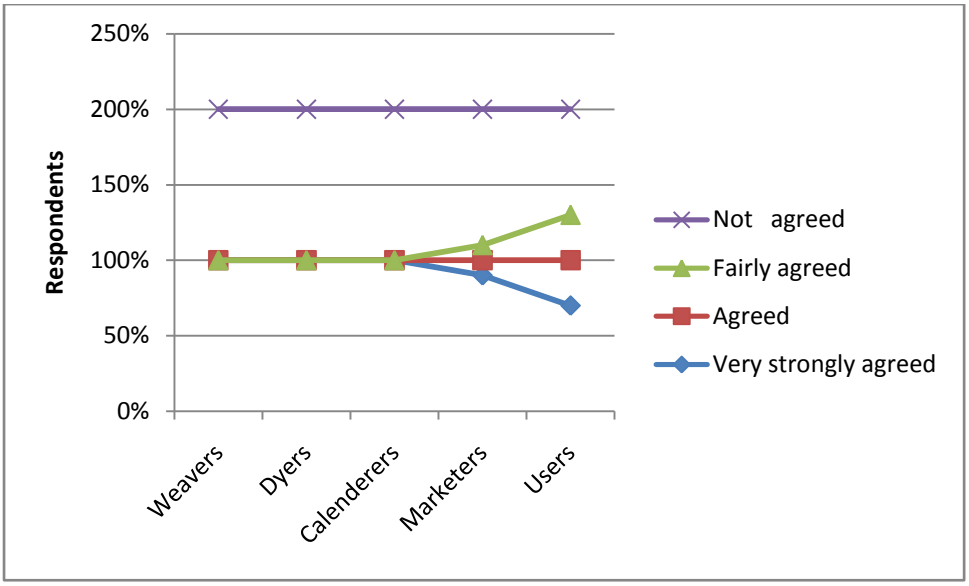


Figure 4.10: Summary of the first basic assumption or null hypothesis 0 rejected by the study and second basic assumption or the alternative hypothesis 1 accepted by the study.

With this hypothesis 0 or the first basic assumption testing of the modified loom products having better quality than the indigenous loom products is false. This is because 92% of the respondents did not agree with the statement, only 8% fairly agreed. The researcher had to reject the hypothesis 0 based on the results gotten from the respondents, thereby committing a type II error. The basic assumption 2 or hypothesis 1 that is the traditional hand woven strips are of better quality than the products of the modified loom is true. This is because 92% of the respondents very strongly agreed with the statement, and the remaining 8% also agreed. The

alternative hypothesis 1 was accepted by the researcher based on the results gotten from the respondents, thereby committing a type I error.

Those involved in the trade all agreed that the trade alone cannot maintain them and their families, and so have to combine the trade with farming which they said is the backbone of their livelihood. The Hadeja/Jama'are River Basin Development Authority supplied them with water for irrigation which made their all year round farming and animal breeding easier. These practices, combining rainy season farming with dry season farming and animal breeding have constituted major factors that helped the local people to maintain their craft works through the inheritance systems. The all year farming and animal breeding have not only prevented the youths from engaging in production and marketing of the narrow strip cloth but also prevented them from attending the western type of education, especially at tertiary level. The researcher observed this when he visited the Kura town when it was not a market day and found that majority of their able youths have their personal farms and rice-farms all the year round and they now have imported rice-trashing mills and produce high quality rice.

Most of them confessed that for animal breeding all you need is to buy a goat, a sheep or a female calf and be going to your farm with it and within two to three years you will have a small herd of animals on your farm. With these professions most of them have married wives, built houses and gone to Hajj and are now big-time producers and marketers of farm and animals produce with little or no western education. For prestige alone the narrow horizontal strip weaving have survived for a period of over a thousand years of traditional textile manufacture.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATIONS

5.1 CONCLUSION

The following conclusions are drawn from the work carried out by the researcher;

1. Imitation is as old as human history, and from father to son and mother to daughter, this has been the trend. The fact that the traditional woven strips are valued so much by their users, does not mean that the imitations could not serve the same purpose. When the manufacture of the Sawaye, the Zugu and the Turkudi strips are perfected on the modified loom it could compete with the traditional cloth, substitute and even bring down the prices of the traditional fabric.

2. If the modified horizontal loom is put under Research and Development study with automation goals, the result could be an automated horizontal narrow strip weaving machine (loom).

3. The modification of the traditional men's narrow horizontal loom from traditional to a mechanized loom could be organized into industrially based small scale textiles centres.

4. For prestige alone the narrow horizontal strip weaving has survived for a period of over a thousand years of traditional textile manufacture.

5. The marketers are buying second hand narrow horizontal cloth at higher prices than the new ones, an indication that the old fabrics are of better quality and that the able hands are no more practising the craft or they have gone to extinction.

6. The traditional horizontal loom fabrics though having value and prestige are going out of extinction because the marketers are already relying on the second hand cloth, referring to them as the best product in the market now.

5.2 RECOMMENDATIONS

The following are the recommendations made based on the work carried out by the researcher;

1. A Research and Development (R&D) that will bring together textile technologists, textile engineers, textile scientists and textile designers to come together under one institute and have a fully automated men's horizontal weaving loom.

2. Our textile technologists should design a curriculum for textile machine design and production which will be strengthened by supporting a postgraduate programme covering textile electronics and loom computer control systems.

3. Government should invest in a strong Research and Development (R&D) for high levels of scientific and technical man-power for promoting indigenous technological development.

4. Government, the textile manufacturers and the association of textile technologists should come together under one roof and invest in R&D for the production of indigenous machines that will form the basis of textile machinery manufacture.

5. The Turkudi veil whose prestige has earned Kura town and its environs a name in Western Sahara should be copied and modified, like the Chinese, in such a way that it will be difficult to differentiate between the two fabrics even at close range, which will serve a useful economic purpose for the nation.

6. The modified traditional men's horizontal loom should not only be motorised, but should be computerized and be a foundation for textile machinery production, if the Indian experience is to be followed for proper industrial development.

7. Further work should be done on the modified traditional men's horizontal loom to improve the quality and aesthetic appeal of its products.

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APPENDIX I

Questionnaire, Interview, and Observational schedules for Traditional Hausa Men's Horizontal Loom Weavers, Loom Accessories Producers and Indigo Pit Dyers.

Dear Respondent Sir,

I am a post-graduate student in the Textile Section of the Department of Industrial Design, Ahmadu Bello University, Zaria, carrying out a research on "The Modification of the Nigerian Traditional Men's Horizontal Loom to Enhance Productivity":

You have been selected to kindly complete this questionnaire, which designed to collect data for a higher degree programme. The study is purely for academic purposes; therefore, all information collected will be treated as private and confidential.

INSTRUCTION: Please answer by making a tick [ ] against your choice or fill in the blank spaces where necessary. You may tick more than one option where applicable.

SECTION A

Personal data

1. Name and position of person providing information_____
2. Did you inherit this weaving occupation? Yes [ ] No [ ]
3. Tribe _____
4. Age_____
5. Sex_____
6. Marital status_____
7. Educational level (western)

   Primary [ ] Secondary [ ] Tertiary [ ] None [ ]

8. Educational level (Islamic) Yes [ ] No [ ]

SECTION B

THE WEAVER'S SHED

1. Name of the weaver's shed _____

2. Location address_____

3. Owner of the shed_____

4. Type of weaves being carried out_____

5. Number of workers_____

6. Number of apprentices_____

7. Do you have a cell-phone? Yes [ ] No [ ]

8. If yes, do you use it in your marketing transactions? Yes [ ] No [ ]

9. Do you make use of machine made yarns? Yes [ ] No [ ]

10. If yes, in what part of the weaving process?

a. As warp yarns [ ] b. As weft yarns [ ]

11. Which product will you prefer?

a. Modified loom products [ ] b. Indigenous loom products [ ]

12. State reason for making your preference._____

SECTION C

THE INDIGO PITS DYERS.

1. Name of the dying Indigo pits _____

2. Location address_____

3. Owner of the pits_____

4. Number of pits in area _____

5. Number of workers_____

6. Number of apprentices_____

7. Do you have a cell-phone? Yes [ ] No [ ]

8. If yes, do you use it in your marketing transactions? Yes [ ] No [

9. Which dyeing method do you prefer?

a. Modern [ ] b. Indigenous [ ]

10. Are you using modern dyes Yes [ ] No [ ]

11. Are you using modern chemicals? Yes [ ] No [ ]

12. If you are not using modern dyes and chemicals state why?

_____

13. Do you do calendaring by yourselves? Yes [ ] No [ ]

14. Do you patronize calenderers? Yes [ ] No [ ]

SECTION D

THE PRODUCERS OF THE LOOM PARTS.

1. With what material do you make reed or beater?

a. Raffia____ b. Wire____ c. Others_____

2. Do you make your own reed or beater? Yes [ ] No [ ]

3. Do you make your own heddles? Yes [ ] No [ ]

4. Do you make your own warps? Yes [ ] No [ ]

5. Do you make your own shuttle? Yes [ ] No [ ]

6. Do you spin your warp and weft yarns? Yes [ ] No [ ]

7. What do you buy in the market?

a. Reed____ b. heddles____ c. warp yarns ____ d. weft yarns ____

e. shuttle_____

8. What do you specialized in production?

a. Reed____ b. heddles____ c. warp yarns ____ d. weft yarns ____

e. shuttle_____

9. Do you have a cell-phone? Yes [ ] No [ ]

10. If yes, do you use it in your marketing transactions? Yes [ ] No [ ]

SECTION D

11. The Modified loom products are of a better quality than the Indigenous loom products.

a. very strongly agreed b. strongly agreed c. agreed d. fairly agreed

e. not agreed

12. The Indigenous loom products are of a better quality than the Modified loom products.

a. very strongly agreed b. strongly agreed c. agreed d. fairly agreed

e. not agreed

13. The Indigenous loom products are of the same quality with that of the Modified loom.

a. very strongly agreed b. strongly agreed c. agreed d. fairly agreed

e. not agreed

14. The Modified loom could be acceptable by the traditional weaver.

a. very strongly agreed b. strongly agreed c. agreed d. fairly agreed

e. not agreed

15. If the Modified loom is made affordable could it be acceptable to the traditional weaver.

    a. very strongly agreed b. strongly agreed c. agreed d. fairly agreed

    e. not agreed.

APPENDIX II

Questionnaire, Interview, and Observational schedules for Traditional Hausa Men's Horizontal Loom woven fabric users and marketers.

Dear Respondent Sir,

I am a post-graduate student in the Textile Section of the Department of Industrial Design, Ahmadu Bello University, Zaria, carrying out a research on "The Modification of the Traditional Men's Horizontal Loom to Enhance Productivity":

You have been selected to kindly complete this questionnaire, which designed to collect data for a higher degree programme. The study is purely for academic purposes; therefore, all information collected will be treated as private and confidential.

INSTRUCTION: Please answer by making a tick [ ] against your choice or fill in the blank spaces where necessary. You may tick more than one option where applicable.

SECTION A

Personal data

1. Name and position of person providing information_____
2. Did you inherit this weaving occupation? Yes [ ] No [ ]
3. Tribe _____

4. Age_____

5. Sex_____

6. Marital status_____

7. Educational level (western)

   Primary [ ] Secondary [ ] Tertiary [ ] None [ ]

8. Educational level (Islamic) Yes [ ] No [ ]

SECTION B

For Traditional Hausa Men's Horizontal Loom woven fabric users.

1. I use indigenous Hausa men's woven garments. Yes [ ] No [ ]

2. How often do use your traditional woven fabrics?

   a. Always____ b. Occasionally____ c. During ceremonies_____

3. How do you procure the traditional woven fabrics?

   a. Through the traditional weaver____ b. From garment shops____

   c. From garment hawkers____ d. Modern boutique____

4. Which of the following advertisements influences you to buy traditional woven fabrics?

   a. Billboards ____ b. Internet____ c. Magazines____ d. Radio____

   e. Telephone____

   g. Television and related media____

5. Which of the traditional garments do you prefer?

   a. Zugu____ b. Sawaye.____ c. Turkudi____ d. State others_____

6. The Modified loom products are of a better quality than the Indigenous loom

products.

a. very strongly agreed b. strongly agreed c. agreed d. fairly agreed

e. not agreed

7. The Indigenous loom products are of a better quality than the Modified loom products.

a. very strongly agreed b. strongly agreed c. agreed d. fairly agreed

e. not agreed

8. The Indigenous loom products are of the same quality with the products of the Modified loom.

a. very strongly agreed b. strongly agreed c. agreed d. fairly agreed

e. not agreed

9. The Modified loom could be acceptable by the traditional weaver.

a. very strongly agreed b. strongly agreed c. agreed d. fairly agreed

e. not agreed

10. If the Modified loom is made affordable could it be acceptable to the traditional weaver.

a. very strongly agreed b. strongly agreed c. agreed d. fairly agreed

e. not agreed

SECTION C

For Traditional Hausa Men's Horizontal Loom woven fabric marketers.

1. Where do you procure the fabrics you sell?_____

2. List the items you sell._____

3. Do you advertise you're your goods in any of the modern I.C.T. outlets such as

radio and television?

a. Yes [ ] b. No [ ]

b. If no, please give

reasons_____

4. Which of the following techniques of trade do you use?

a. Sitting in the shop [ ] b. Hawking [ ] c. Following market days [ ]

5. What do you use to transport you in your business transaction? a. Foot [ ]

b. Bicycle [ ] c. Motor cycle [ ] d. Motor vehicle [ ] e. Wheel barrow [ ]

6. Do you have a cell-phone? Yes [ ] No [ ]

7. If yes, do you use it in your marketing transactions? Yes [ ] No [ ]

SECTION D

11. The Modified loom products are of a better quality than the Indigenous loom products.

a. very strongly agreed b. strongly agreed c. agreed d. fairly agreed

e. not agreed

12. The Indigenous loom products are of a better quality than the Modified loom products.

    a. very strongly agreed b. strongly agreed c. agreed d. fairly agreed

    e. not agreed

13. The Indigenous loom products are of the same quality with that of the Modified loom. a. very strongly agreed b. strongly agreed c. agreed d. fairly agreed e. not agreed

14. The Modified loom could be acceptable by the traditional weaver.

    a. very strongly agreed b. strongly agreed c. agreed d. fairly agreed e. not agreed.

15. If the Modified loom is made affordable could it be acceptable to the traditional weaver. a. very strongly agreed b. strongly agreed c. agreed d. fairly agreed e. not agreed.

APPENDIX III



Figure 2.1 Joseph Marie Jacquard

Source: MHTML 2011

APPENDIX IV

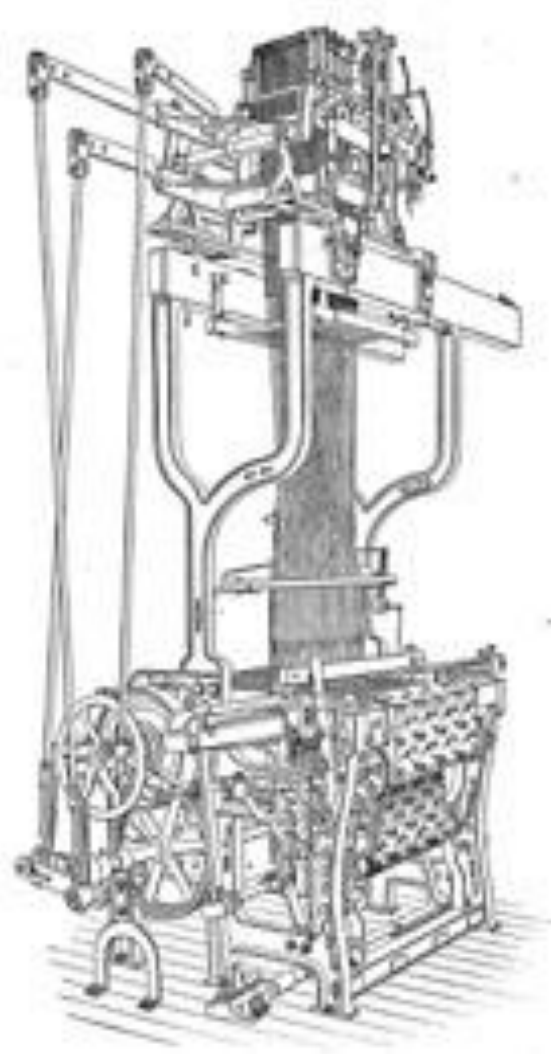
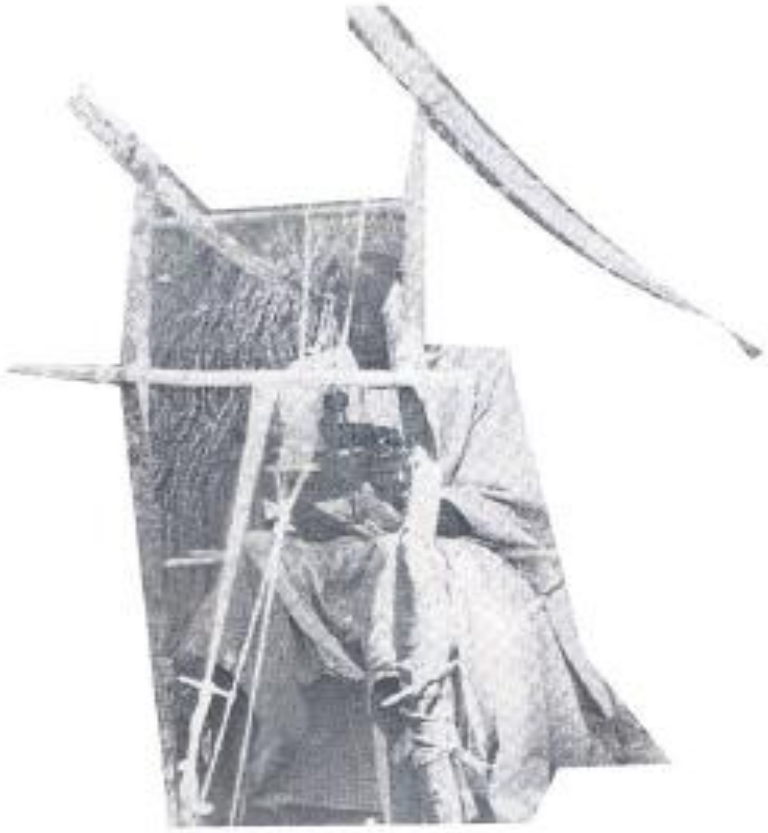


Figure 2.2 Jacquard Machine

Source: MHTML (2011)

APPENDIX V



Beater and Heddles Hung on a Cross-bar

Source: Nigerian Weaving by Lamb and Holmes (1980)

APPENDIX VI



Figure 2.6: Wooden Heddle Pulley

Source: Nigerian Weaving by Lamb and Holmes (1980)

APPENDIX VII

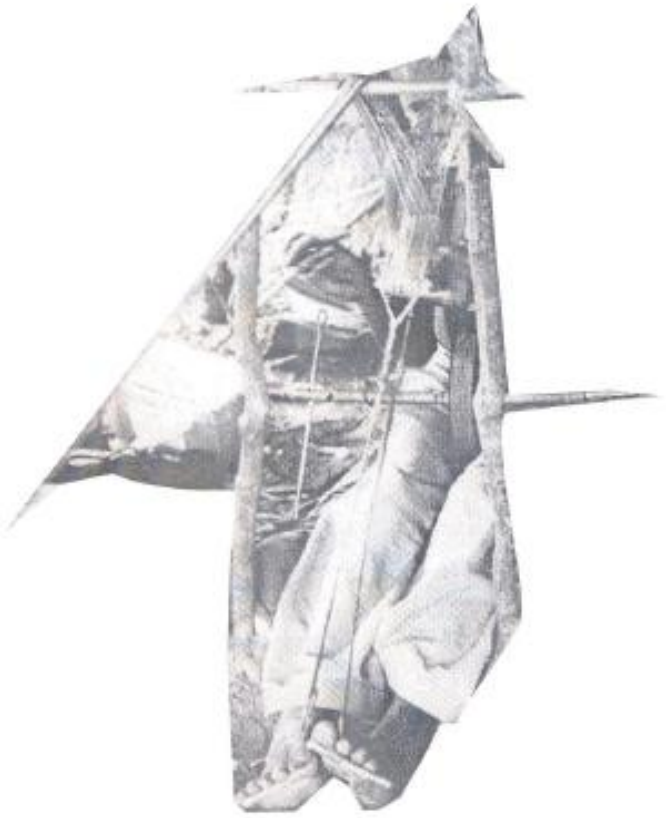


Figure 2.7: Pedals Movements from a Fulcrum

Source: Nigerian Weaving by Lamb and Holmes (1980)

APPENDIX VIII



Figure 2.8 Single Pole above the Weaver's Head

Source: Nigerian Weaving by Lamb and Holmes (1980)

APPENDIX IX

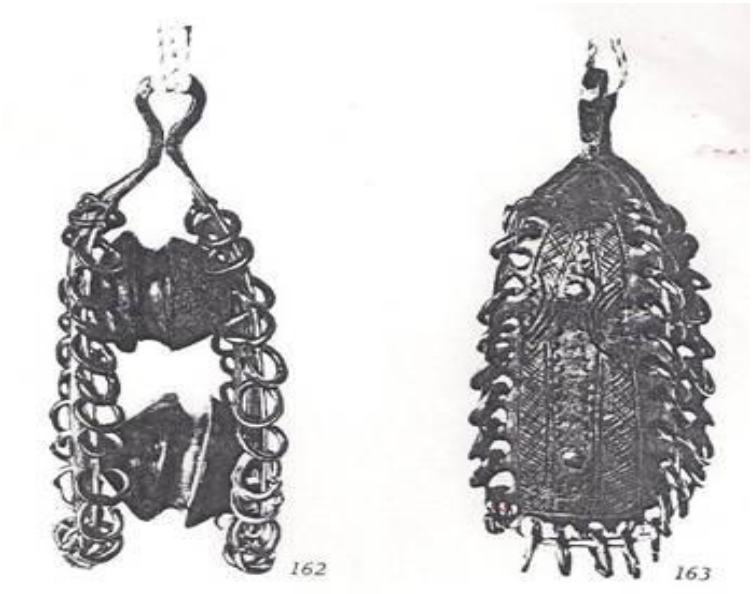


Figure 2.9 Metallic Shaft Pulleys

Source: Nigerian Weaving by Lamb and Holmes (1980)

APPENDIX X

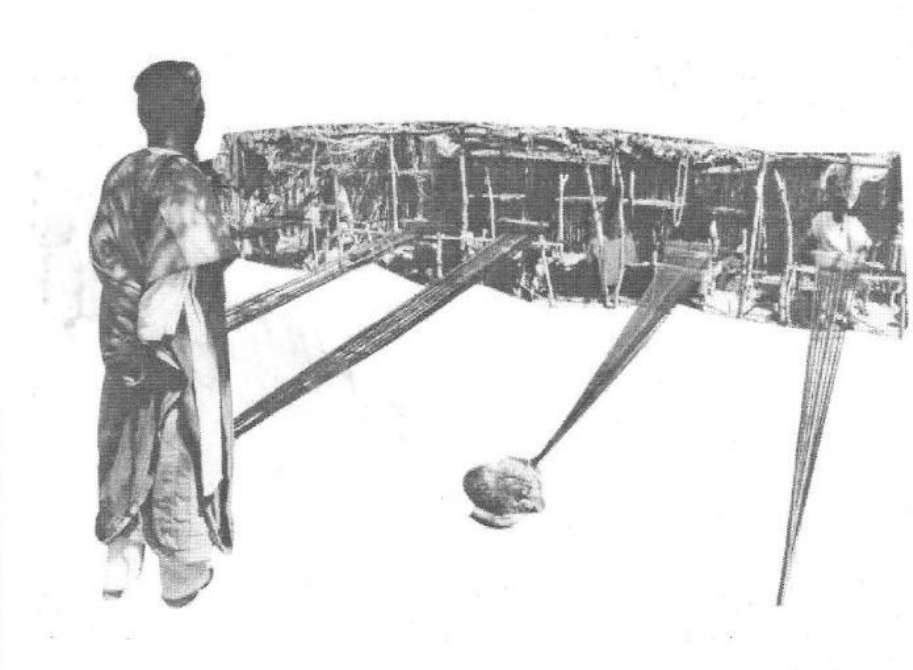


Figure 2.10 Warps Lay Out on the Ground

Source: Nigerian Weaving by Lamb and Holmes (1980)

APPENDIX XI

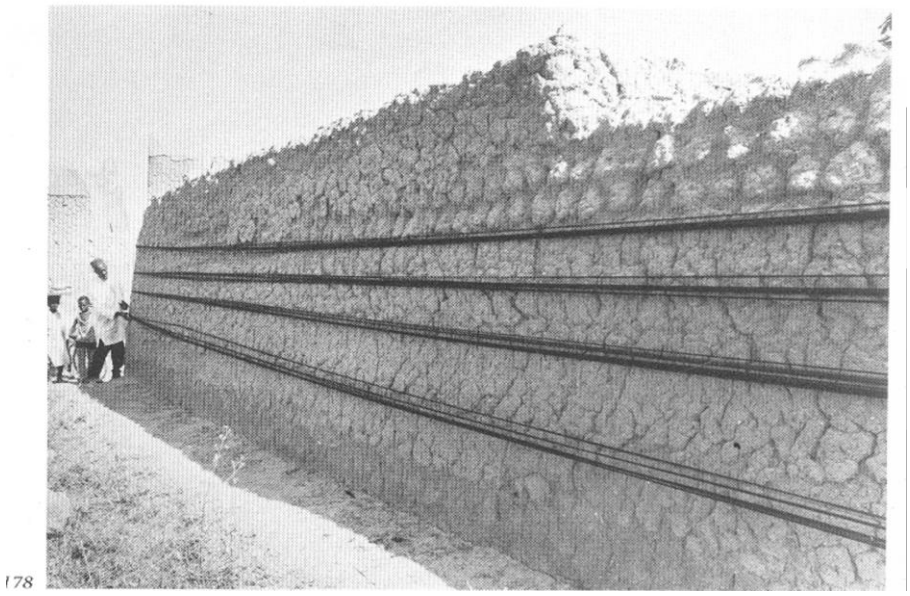


Plate 2.11: Warps strung up along wall

Source: Nigerian Weaving by Lamb and Holmes (1980)

APPENDIX XII

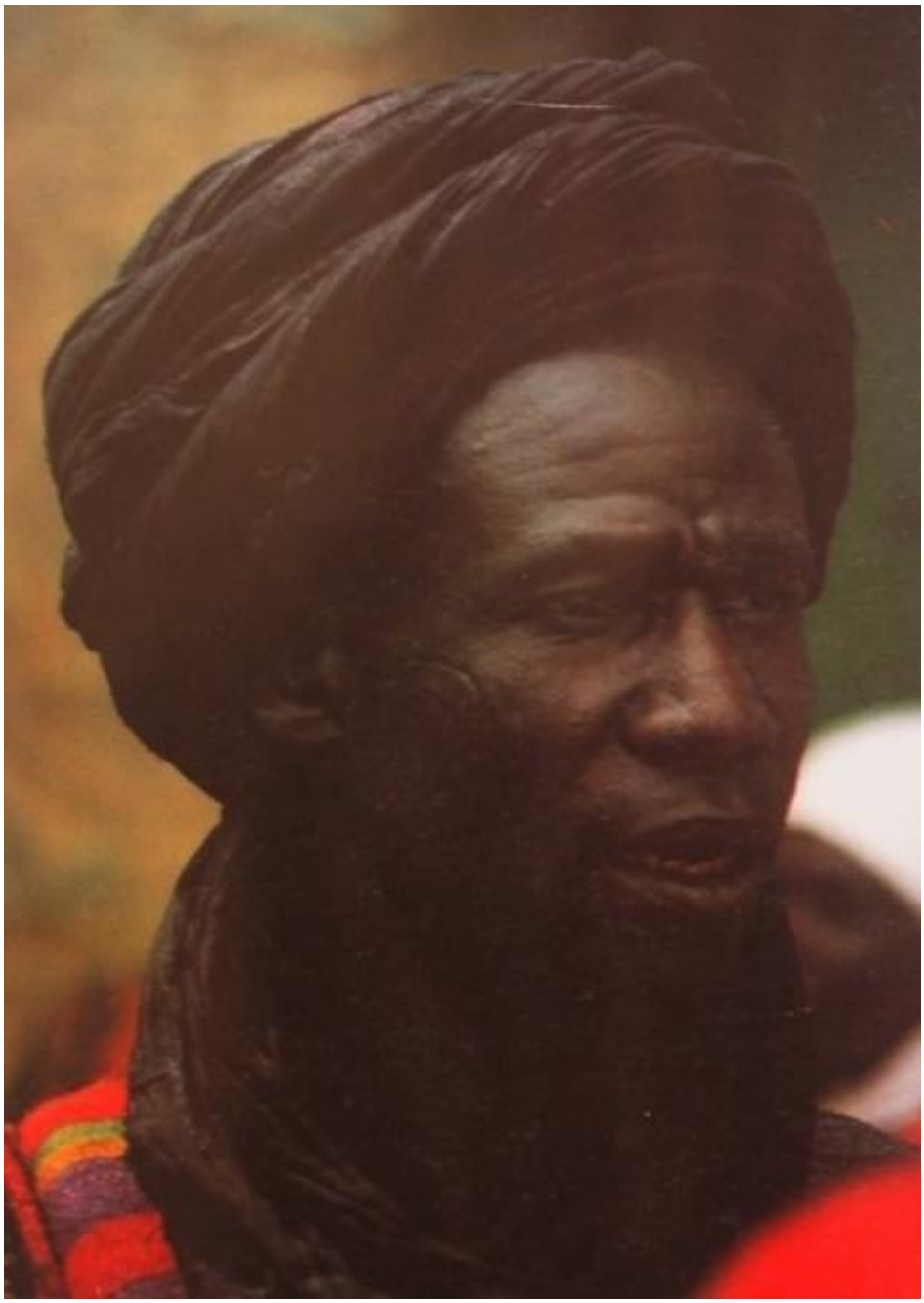


Plate 2.1: Source: Lamb and Holmes (1980)

Hausa man wearing indigo blue Turkudi turban

APPENDIX XIII



Plate 2.2: Source: Bing Images (2014)

Tuareg man wearing indigo blue Turkudi turban