TABLE LOOM FABRICATION AND PRODUCT DEVELOPMENT

BY

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OCTOBER, 1998

DECLARATION

I hereby declare that this thesis is an original and true record of my research work. It has not been submitted elsewhere for the award of any degree.



Adetayo O. Ayotade

DIGITIZED

OCTOBER, 1998

CERTIFICATION

This thesis titled; "Table Loom Fabrication and Product Development", written by Adetayo, O. Ayotade meets the regulations governing the award of the degree of Master of Arts (M.A Industrial Design) of Ahmadu Bello University, Zaria, Nigeria and it is approved for its contribution to knowledge and literary presentation.

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DEDICATION

This study is dedicated to the ever green memory

of my parents:

Pa. R. K. AYOTADE

and

Madam C. O. AYOTADE

It is also dedicated to my soul mate:

Mrs. F. T. AYOTADE

and

the Children

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ABSTRACT

TABLE - LOOM FABRICATION AND PRODUCT DEVELOPMENT

Adetayo, O. Ayotade

This study is informed by the need to sustain weaving craft in Nigeria as a means of attaining the following: the much desired socio-economic and cultural growth; self-reliant development and rural Industrialization; and the development and preservation of our cultural heritage. Evidently, it has concentrated on the following: fabrication of a modified, relatively inexpensive table-loom, using local materials and resources; conducting experimental weaving on the said loom, using conventional, factory made yarns, self-dyed if need be; and utilizing the resultant fabric in developing certain products.

There was the need to address the problem from both theoretical and practical perspective. In order to provide a theoretical frame-work for this study, available related literature were consulted and synthesized to broaden the researcher's horizon in the following areas: historical evidence of weaving; evolution of the loom; types of looms and their structure; weaving processes and techniques; and raw material for weaving.

Data for this study were collected through the primary and secondary sources, using multiple instruments, as suggested by Pelto (1970). These instruments include: Oral inquiry, observation and photography. Also, field work and pilot study, which entail workshop and studio experimentation, were conducted.

The findings indicated that an eight-shaft, two-warp beam, table loom could be fabricated from 100 per cent local material. The accuracy of the said loom was evaluated by comparing its structural proficiency and performance with that of other manual looms through practical weaving. Data gathered through the various sources were sufficient for the comparison. It was discovered that the loom, in all its ramification, compared favourably with existing manual looms; and performed well for a good range of hand woven fabrics. The products developed from the resultant fabrics were found to awaken pleasurable response.

The findings of this study, within the context of the specified area, suggested several directions, with implications for Nigerian weaving - craft industry, tertiary institution and vocational centres. Also, method of deriving maximum benefit from this study was suggested and recommendation, for further research, made.

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ABBREVIATIONS

F.S.P.	-	Family Support Programme
F.E.A.P.	-	Family Economic Advancement Programme
R.M.R.D.C.	-	Raw Material Research and Development Council
S.A.P.	-	Structural Adjustment Programme
R.H.S.	-	Right Hand Side
L.H.S.	-	Left Hand Side
e.p.i.	-	Ends Per Inch
d.p.i.	-	Dents Per Inch
p.p.i.	-	Picks Per Inch
m.m.f.	-	Man Made Fibre
E.W.	-	Experimental Weaving
R.P.m	-	Revolution Per Minute

SYMBOLS

O	-	Heddle Through Which Warp-End is Drawn
X	-	Shaft Lifted to Create a Shed
■	-	Interlacing Point, Where the Warp is Over the Weft
□	-	Interlacing Point, Where the Weft is Over the Warp

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CHAPTER - ONE

1.1 BACKGROUND OF THE STUDY

Weaving is one of the oldest crafts practiced by man. In the very early stages of man's development, weaving satisfied two of man's most essential needs: these are clothing and shelter.

Although, a tedious business, the early man learnt to weave long before he invented the loom. Held (1978), opined that; long before, and after man discovered the advantages of weaving flexible materials through a set of stretched strands, he had developed methods for interlacing strands to create functional and utilitarian fabrics and objects. Among the various methods developed by man for interlacing strands to create functional and utilitarian fabrics and objects, those that pre-dates loom weaving include; felting, matting, sprang, netting and basketry - to mention but few. Others which include: lace making, knitting, bounding and twining, etc., can be considered as new development, relative to the long history of fabric construction.

Weaving has been and still is an essential industry in even the most primitive setting. Virtually every culture with a tradition of weaving has devised some kind of frame with which to facilitate the interlacing of yarns. Salako (1992) stated that; the foundation of the textile industry

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in Nigeria was built around narrow fabric weaving craft on indigenous handloom and indigo pit dyeing.

The origin of weaving craft in Nigeria is obscure as there are divergent scholarly view on it. Hodge (1992) contends that; indigenous weaving-craft in Nigeria may have been based on the idea of mat making. Whereas Afigbo (1982), revealed that; weaving in Igbo traditional has a local origin. One of the local Igbo beliefs that corroborate Afigbo's view, has it that the first woven material ever worn by man was produced by a pregnant woman. It was claimed that she acquired her weaving skill by observing a spider weaving a web. Despite all the scholarly opinion, many Nigerians will still prefer to view the origin of textile production in general, and weaving craft in particular, as so ancient that they would rather place it in the mythical past. The Dogon mythology, as opined by Peggy (1987), is one such mythical past, whereby weaving was viewed as a spiritual expression at the core of the creation of the world - the means by which order was created out of formlessness.

As one of the earliest industry to be exploited by Nigerian, weaving-craft was, and is still being commonly carried out on looms based on indigenous technology. These looms, which have undergone substantial modification and

improvement in the bid to increase their design capabilities, production rate and the quality of the fabrics woven on them, are of two types; the horizontal and vertical looms. Although, these looms are found in some part of the Country, they are, however, believed to have independent origin.

In recent times, while some craft-weavers still continue to rely on the aforementioned traditional looms for their production, weaving craft has been incorporated into the curriculum of many art and design schools, colleges, universities and vocational centres, where the emphasis is on interpreting the traditional concepts and forms in contemporary language. Consequently, in today's Nigeria, two groups of craft-weavers and their looms can be identified - the traditional craft-weavers, who acquired their skill through the informal education system, such as the indigenous apprenticeship system; and the contemporary craft-weavers, who went through the formal education system, in any one of the numerous institutions of higher learning and vocational centres. In some cases the latter group has the opportunity of being trained on both the indigenous looms and foreign ones, imported into the Country. In view of this, craft-weavers of nowadays have at their disposal a wide variety of improved modern and precision looms and accessories, these, aid the weaving process and encourage

professionalism. In substantiating this statement, suffice it to make reference to the Gwarzo Weaving Centre in Kano State, which in 1984, was equipped with 30 improved modern handlooms, imported from India. Also, Southern (1979), observed that; improvements based on inventions belonging to the sixteenth and eighteenth centuries, which have revolutionised clothmaking in Europe, were seen in their simplest form in the spinning wheels and broad looms, coming into increasing use in Nigeria. He went on to state that the introduction of these looms and spinning wheels opened the eyes of Nigerian craft-weavers to a different approach to one of man's oldest crafts.

With the advent of mechanised textile manufacturing in the wake of Britain colonisation of Nigeria, weaving craft in the Country suffered some set back in terms of product patronage and participation. However, with time, weaving craft was once more flourishing. Its revival can be credited to the awareness created in the populace by the Festival of Arts and Culture (FESTAC), held in Nigeria in 1977. Also, the economic exigency that has befallen the Country from the 1980s to date could be said to have played a vital role in the revival of weaving craft in Nigeria. These two over-riding factors, among others make the Governments and people of Nigeria to come to terms with the realities of contemporary period. They now recognise the

fact that, perhaps, more than any other art form, textiles in general, and weaving craft in particular, reflect the cultures from which they come and can contribute in no small measure to the socio-economic and political growth of the Nation. Peggy (1987), viewed textiles as; simultaneously, personal, societal, religious, and political. She also pointed out that, they are valuable vehicle for the spread of ideas from one culture to another; and sees African weaving as a vibrant medium that conveys the essence of an African aesthetic.

Just like more and more Nigerians are now looking inwards and increasingly patronising made in Nigeria goods, given the prevailing adverse economic trend, the Government of the day has come to appreciate the need to develop crafts in general, and weaving craft in particular to generate rural employment. According to the former First Lady of Nigeria, Mrs. Mariyam Abacha, extensive employment opportunities should be created by utilising the surplus rural labour force; and women could be employed increasingly by developing the handloom (manual-loom) sector. In pursuance of this view, the said First Lady, initiated the Family Support Programme (F.S.P), which now gave birth to F.E.A.P. The programme has been taking various steps in developing weaving craft, along with other crafts. She has

proposed a craft village in the Federal Capital Territory, Abuja.

It is against this background that this study is motivated to complement the various efforts being geared at the development of weaving craft in the contemporary period. The view of Ali (1986), that her study may suggest ways whereby a more comprehensive loom can be constructed to unify the weaving process employed by the traditional and contemporary craft-weavers, further reinforced the motivating factors.

Institutions of higher learning and vocational centres in the Country have been turning out trained craft-weavers, who on graduation, have been finding it extremely difficult, if not impossible, to practise their chosen profession. This may be attributed to the following: non-availability of the improved, modern, manual-looms on which they were trained; the exorbitant price tags placed on the few available looms; and the hugeness and complexity of these looms. This consideration has also informed the conceptualization of this study.

1.2 STATEMENT OF THE PROBLEM

It is becoming more and more difficult to source for foreign exchange with which to keep on importing improved,

modern, handlooms into the Country. As a result, contemporary craft-weavers are worse off. Where craft-weavers, not wanting to back out of their chosen profession, resolved to making use of the commonly available indigenous manual looms in carrying out their trade, they are often confronted with the problem of floor space. Given the large size of most of these looms that had to be imported and adapted to indigenous weaving craft and the need to stretch out the warp, for considerable distance, in the case of certain traditional looms, abundant floor space is most certainly required for the installation of these looms. Also, it is usually not easy to move these looms within the space in which they have been installed, talkless of transporting them to other locations.

In order to sustain the revival of weaving craft recently witnessed in the Country, products of the craft should remain aesthetic artifacts, reflecting creativity, tradition and integrating the old and the new ideas. The question as to whether this is achievable is very important, if weaving craft is to contribute meaningfully to the socio-economic and cultural growth of the Nation. It is to these ends, therefore, that this study will address the issue of Table - loom fabrication and product development. Results from the study may come up with a fabricated, medium size

and relatively inexpensie manual loom, capable of weaving fabrics suitable for the development of various produccs.

1.3 OBJECTIVE OF THE STUDY

Numerous scholars, both home and abroad, who have carried out investigation in the area of Nigerian weaving craft, seem to have either neglected to have thoroughly addressed the issues of the adaptation and adoption of the table loom into indigenous weaving craft. The exploration and exploitation of the fabrics which can be woven on the table loom seem not to have been also given adequate consideration, in the development of innovative products.

This researcher finds it expedient, therefore, to further investigate these areas with a view to:

i. Evaluate the table loom as an appropriate device for small scale woven fabric production.

ii. Fabricate a proto-type of the table loom, with innovations.

iii. Carryout experimental weaving on the fabricated table loom in order to ascertain its suitability for cloth production.

iv. utilise the fabrics thus woven on the loom for innovative product development.

1.4 RESEARCH QUESTIONS

The underlisted research questions are expected to guide the study:

i. Which are the functional parts of the basic loom, and of what significance are they to the appearance of a woven fabric?

ii. What are the limitations of a table loom and how do they affect its adoption into weaving craft in Nigeria?

iii. What are the factors to be considered in fabricating a table loom that will be adapted into weaving craft in Nigeria?

iv. To what extent can the raw materials for the intended table loom be sourced locally?

v. How far can the fabricated loom be compared with the imported one in terms of design formulation?

1.5 SIGNIFICANCE OF THE STUDY

The importance of this study will be treated along the following lines; general importance (which includes; survival and protection, and appearance of man); and specific importance (which include; educational, economic, cultural, and self-reliance concept).

1.5.1 General Importance

Scholars have long debated the initial impetus that led Man to clothing his body. Was it a quest for protection from the elements of climatic conditions, a desire for power and prestige, or simple modesty, that made Man take this step? Most authorities agree that, although virtually every known culture has utilized some sort of clothing (if only a tiny loin cloth), modesty could be regarded as a later development. Not until the weaving of clothes had become common-place did people acquire vanity and the feeling that nudity was shameful.

Furthermore, since the dawn of civilization in the warm regions of the earth, clothing could not be said to have been essential for comfort or for protection from the environmental elements. It seems likely, then, according to Held (1978), that clothing first developed in a display of power to frighten the enemy or to demonstrate the skill of the hunter, who adorned himself with furs as a testament to success in the hunt.

With time, rudimentary textiles were substituted for the pelts, and clothing does not only become a means of differentiating Man from animal, but also that of gaining social approval, as well as important expression of cultural values. When we now talk of the three basic human

necessities, clothing is mentioned along with food and shelter. The increasing popularity of clothing had led to a heightened demand for textile, which in turn stimulated weaving and invention and development of the loom.

Considering the on-going, the relevance of this study cannot be under-estimated, in that it will contribute towards the quest for the provision of one of Man's basic needs - clothing.

1.5.2 Specific Importance

1.5.2.1 Educational

Most researches, previously conducted, have concluded by recommending a study of this nature. However, recent investigations have shown that the problem area, within the specified scope, seems to have either been neglected or not to have been thoroughly addressed. This study is therefore, significant in that it will carry out a thorough investigation of the problem area, and the result will be available for the benefit of the craft-weavers.

Furthermore, contemporary craft-weavers, who went through formal education, in institutions of higher learning and vocational centres, are trained, in most cases, on looms other than the traditional ones. However, on graduating, they usually find it extremely difficult to practise their

chosen profession due to non-availability of the loom on which they were trained. In corroborating this view, Aliyu (1996), states that; the Weaving Centre at Gwarzo Local Government Area of Kano State has been turning out trained weavers, who on graduation from the Centre, still go back to use the traditional loom, because of the non-availability of the imported ones they trained with at the Centre. In addressing this problem, he further states that; the Kano State Government, in collaboration with the R.M.R.D.C., were exploring avenues of improving the efficiency of indigenous weaving through the fabrication of the improved, modern manual-looms. This study, therefore, becomes significant, in the sense that it will contribute toward the research and development efforts of these two organisations (R.M.R.D.C, Abuja and Gwarzo Local Government, Kano). It has really actualized the theoretical framework of the objectives of these institutions.

The study will also be significant in that it will serve as a reservoir of knowledge, thereby complementing existing literature in the area of weaving craft in Nigeria, loom fabrication and product development. While providing a valuable reference for further studies in this area, the study will also serve as a model upon which greater ideas can be based in future.

1.5.2.2 Economic

It has been established that most looms used for teaching in institutions of higher learning and vocational Centres are imported. Aliyu (1996), opined that; the Kano State Government, recognizing the fact that it could not continue to import these looms into the Country, decided to fabricate them locally. This situation, is not peculiar to Kano State, in the Federation, and even the Federal Government is faced with same problem. Thus, in view of the prevailing economic exigency, the imported looms are hardly obtainable in the Country. Given the on-going, the importance of this study cannot be over-looked,
in that; it will further assist to conserve foreign exchange, which is ever becoming scarce.

Weaving craft, along with other crafts, constitutes a viable investment with sizeable returns in foreign exchange. Like those of other crafts, the products of weaving craft are bought by tourists, who visit Nigeria, largely because they are of exotic interest to them. They buy Aso-Oke (the Yoruba traditional cloth), Luru cloth (of the Hausa), Akwete cloth (of the Ibo) and Okene cloth (of the Ebira people), etc., because it is fashionable in their Country to own some of these out-landish products (Nsugbe, 1962). Since the outcome of this study (a table loom) will be able to produce the above mentioned indigenous fabrics

and others, its economic importance lies in the fact that it will contribute to boost the Nations foreign exchange earnings.

The study is also very relevant to the current effort being made to sustain the resurgence of crafts in the Country. Over the years, the volume of trade in weaving craft products, along with other crafts goods, has increased to the extent that old techniques can no longer cope with the growing claims of new needs. Also, the importance of the study cannot be underscored in view of the contribution it will make to efforts currently being made to develop weaving craft, along with other crafts in the Countvy. These efforts are expected to yield the following gains: the creation of extensive employment opportunities (this has been demonstrated by numerous Nigerian craft-weavers, who are both self-employed and employers of labour); utilization of the surplus rural labour force; and the check on rural-urban migration of the populace.

1.5.2.3 Cultural

It has been established that textiles in general, and weaving craft in particular, reflect the cultures from which they come and can contribute in no small measure to the socio-economic and cultural growth of the Nation. Nsugbe (1962), states that; more than anything else, craft

products play an important role in projecting Nigeria's image and culture effectively to the outside world. In addition, he contends that craft products have, in this way, become one of the most informal, yet most powerful, fronts of Nigeria's self-publicity abroad.

Furthermore, many societies outside the Western world, still regard their textile crafts as important expressions of cultural values. Most scholars are of the opinion that traditional dress and textiles in Nigeria are significant for their roles as markers of socio-cultural rank and indicators of ritual importance (this is demonstrated by the fact that marriages, funerals, and other rituals governing the physical and spiritual world's require proper cloths).

Since the envisaged loom to be fabricated will be capable of integrating the old and new techniques of producing cloth, thereby reflecting creativity and tradition in its products (which will remain aesthetic artifacts), its socio-cultural significance cannot be over-emphasised. The study will not only contribute towards sustaining the revival of weaving craft, but also towards it's development.

The need for development was stressed by Fadairo (1983), when he opined that; one of the ways to maintain the Nation's uniqueness and identity is through the development

of our various cultures. Consequently, this study is not only important in that it will contribute significantly in making weaving craft product remain aesthetic artifacts, but because it will also help in preserving, developing and promoting the nation's cultural heritage.

1.5.2.4 Self-Reliance Concept

The role of weaving craft within the context of self-reliance concept cannot be over-looked. Woven fabric ranks high among craft products, which have been used to demonstrate the fact that Nigerians can conveniently meet their essential needs with little or no external assistance. In contending with the economic hardship prevailing in the Country, the Governments and the populace have come to recognise textile crafts in general, and weaving craft in particular, as avenues that could be explored for the utilization of local resources to meet daily needs - in this case, clothing needs. This explains the prominence and unprecedented acceptance being enjoyed by textile crafts in recent times. To this end, the study is very important, in that it will foster the statusquo of weaving craft in the Country, which, invaribaly, will stimulate self-reliance.

Despite her abundant human and natural resources, Nigeria, for long, has been a consumer nation, depending largerly on foreign nations for her essential needs.

However, the economic exigency that has be-fallen her since the early 1980s, has made Nigerians to see the need to cultivate the culture of production (no matter how small), and desist from the practice of relying on importation for essential goods - this calls for backward integration, as examplified by this study.

The need for backward integration - i.e., the exploration, exploitation, and utilisation of local raw materials (non-oil resources), - in the Country has been receiving attention since the introduction of the Structural Adjustment Programme (S.A.P). Even though much have not been achieved, among the more recent programmes designed to alleviate collective poverty is F.E.A.P., initiated by the former First Lady, Mariyam Abacha. This programme is aimed, among other reasons, at the attainment of self-reliance, through the development of the various crafts in the Country. Thus, this study could not have come at a better time.

More recently, in presenting the analysis of the 1998 Budget to the Nation, the Honourable Minister of Finance, Chief Isaac Ani, implored Nigerians to go into production of goods to meet the Country's needs. This is the only way Nigeria can be moved forward - he opined. The relevance of this study, therefore, lies in the fact that it

will serve as a positive response to the clarion call of the Honourable Minister of Finance. Furthermore, this effort will give practical demonstration to the policy of local sourcing of raw materials and backward integration for self-reliant, development and industrialisation; a goal seriously being pursued in Nigeria today.

1.6 SCOPE OF THE STUDY

It may be seen very romantic to want to involve this study in the whole fabric making process - from fibre production to its conversion to yarn; dyeing of the yarn to weaving it into fabric on all available type of looms, and finally, developing products with the fabrics woven - but even with the best of intension, this is a utopia. There is no time for such an all embracing approach, if one is interested in carrying out a thorough investigation within the context of the set out objective(s).

Certainly, every scholar in this area of study should be familiar with, and have ample knowledge of all arms of the subject area. However, to be practical, one just have to decide on an aspect to concentrate on. In this regard, this study will be confined to the fabrication of a modified, relatively inexpensive table loom. The assistance of a competent resource person will be sought on issues concerning wood-work.

Furtherore, experimental weaving will be carried out on the fabricated loom, employing factory made yarns of var ous fibre-type and count. The yarns will be self-dyed, if need be. The resultant woven fabric from the experimental weaving will be developed into numerous products. This researcher will also seek the assistance of competent resource persons in the technicalities involved in the development of the various products.

1.7 BASIC ASSUMPTIONS

Craft-weavers, even the beginners, must be thoroughly familiar with the parts of existing looms and their functions, because once mastered, the individual elements should be easy to recognize on any other loom, Held (1978). Based on this fact, it is assumed that contemporary craft weavers in the Country will be able to understand the full potential of the fabricated loom, and be able to match its performance with their creative ideas.

It is this researchers assumption that a skilled carpenter or woodcraftsman should be able to handle the wooden aspect of the loom construction; while a skilled blacksmith should be able to handle the metal aspect.

1.8 DEFINITION OF TERMS

In the context of this study, these are the meaning of the following terms:

Weaving: This is the process of interlacing the two constituent set of yarns, warp and weft, to form a web-like structure.

Fabric: This refers to the web-like structure that evolves from the pre-determined manipulation of fibres and yarns, using appropriate machines, wooden frames, tools and equipments.

Fibre: This can be defined for textile purpose, as a unit matter, characterised by flexibility, finness and high ratio of length to diametre.

Yarn: It is a flexible configuration of fibre assemblage drawn from a fibrous mass and held together by the insertion of adequate amount of twist, by a process known as spinning.

Warp: This is the length-wise or vertical yarns in woven fabric. It is also individually referred to as "End".

Weft: This refers to the cross-wise or the horizontal strands of yarns in a woven fabric, which interlace with the warp at right angle to form cloth. It is also known as `Pick', `Filling', `Woof'.

Textile: It is derived from `TEXERE', a Latin word, meaning to weave. It is a term used for fibres, yarns, and other materials, products and processes employed in the manufacture of fabrics.

Loom: This is a device, wooden frame or machine employed in facilitating the interlacing at right angle, of the two constituent yarns of a woven fabric.

Handloom: This refers to the manual loom as against the mechanised loom.

Craft: As defined in the Advance Learner's Dictionary, it refers to occupation, especially one in which skill in the use of the hand is needed.

Art: Dictionary definition has it as; the creation or expression of what is beautiful, especially in visual form; fine skill or aptitude in such expression.

Indigenous Weaving Craft: Refers to the weaving craft that is native to Nigeria; that weaving craft belonging naturally to Nigeria.

Count of Yarn: Otherwise referred to as; yarn count, yarn number, yarn linear density or yarn size, is a number indicating the mass per unit length or length per unit mass of a yarn.

Spinning: Refers to the process or processes, used in the production of yarn. This term may apply to the drafting and twisting of natural or man-made fibres.

Knitting: The process of forming a fabric by the intermeshing of loops of yarns.

Matting: This is the technique commonly practised in the tropical regions of the world in the production of Tapa cloth by pounding the back of some kind of trees.

Felting: It involves the interlocking of loose fibres by a process that combines heat, moisture and pressure in the temperate regions of the world.

Netting: It is a looping and knotting technique done on a single continuous strand or yarn.

Sprang: Sometimes called meshwork, interlacing, or Egyptian plait work, involves a set of stretched parallel yarns twisted upon one another. It consists of no weft, or cross-wise thread.

Basketry: This is the process of making objects from various semirigid vegetable materials, such as grass, rushes, reeds, and sticks.

Twining: Is a process, developed from that of a twined basketry, whereby one or both of the set of strands may be flexible, and consequently the product is more pliable, though not so soft as a woven fabric.

Lace Making: Is an intricate twisting of fine threads done in such a way as to form a pattern.

Bounding: This is a technique that consist of bonding the fibres together with an adhesive, stitching or needling and spon-bonding.

Dyeing: Is the process of applying a colourant that has substantivity for a substance either inherent or induced by reactants.

Point Paper: Otherwise known as design paper, is a ruled paper with vertical and horizontal lines, similar

to that of a graph paper, in a manner suitable for showing weaves and designs.

Rushes: Stem of one of numerous varieties of marsh plant with slender leafless stems containing pith, often dried and used for making seats or chairs, for weaving into baskets, etc.

Drafting: Also refers to as drawing-in, is the order in which yarns are drawn through the heald-eyes before weaving.

Dent: The unit of a reed, comprising a reed wire and a space between adjacent wire.

Reed: A device consisting of several wires, closely set between two slats or baulk, that may serve any or all of the following purposes, separating the warp yarns, guiding the shuttle, and beating up the weft.

1.9 SUMMARY

Chapter one covers the background of the study, states the problems, objectives and research questions to which answers are sought. It also takes care of the significance of the study, the scope, basic assumption and definition of terms.

A review of available, related literature to the study shall be considered in chapter two.

CHAPTER - TWO

REVIEW OF RELATED LITERATURE

2.1 INTRODUCTION

From the beginning, weaving craft, which involves the making of cloth, was of great importance. Most scholars agree that, virtually every known culture has used some sort of clothing - if only a tiny loin-cloth. Throughout the world, weaving went through various stages as means were sought to increase the number of yards woven to meet the cloth demands of rising populations.

In her perception of narrow cloth weaving, Gilfoy (1987), states that, most publications on West African cloth have focused on the technique of manufacture, especially the looms and the materials. In her own opinion, this area is well covered. Contrary to this view, Brostoff (1978), recalls that, only recently did written records begin to be kept of some of the weaving craft processes. Though, she conceded that there are indications in early diaries of various fabrics and their uses, and many references to weaving craft in the diverse sources, she still opined that rarely is there found a deliberately detailed description of the actual looms or weaving techniques. She went further to state that, the few written records all claim their

particular findings to be accurate, but for a number of reasons, much of what we have been accepting as historically accurate are questionable. She substantiated this view by drawing attention to the fact that many weaving craft processes were handed down from generation to generation and kept secret from outsiders. In addition, she opined that early craft weavers could not write, nor did they have the time or the need to record what was so much a part of their every day struggle for survival.

In the researchers view, and in reasoning along with Brostoff and other scholars, many early weaving craft processes were not recorded and have been totally forgotten or lost. This view is informed by the well known phenomenon, as true today as in the past, that practitioners of the weaving craft, as with other crafts, tend to conceal what they consider their occupational secrets. This is done mainly to protect their source of income, which might be threatened if they were to reveal the methods or formulae on which their craft is based. Thus, what we now consider as historical record of weaving craft, are in most cases the outcome of many hours of analysis carried out on unearthened pieces of cloth and lyrics of tools and equipments in an attempt to reconstruct the weaving procedures and identify fibres. Many reproductions of looms that are available to us today must have been drawn by the artists of that time,

who were non-weavers. Thus, more often than not, their records were inaccurate, because they were drawing or writing from observation rather than participation.

Be this as it may, the chapter reviews available related literature under the following headings, focussing on Table loom fabrication and product development:

i. Historical Evidence of Weaving Craft
ii. Evolution of the Loom
iii. Types of Looms and their Structures
iv. Weaving Processes and Techniques, and
v. Raw Materials for Weaving

The review of related literature is in accordance with the suggestions of Adetoro (1997), Ary, et al (1978), and Gilbert (1968), who view the synthesis of related literature as an essential ingredient to the development of a sound research design. The researcher has, therefore, chosen relevant literature for review, using both the primary and secondary sources.

2.2 HISTORICAL EVIDENCE OF WEAVING CRAFT

Scholarly evidence abounds to reveal the practice of weaving craft the world over, and in Nigeria, for quite a while now. Newman (1974), corroborating the position of Benton (1943), states that, textiles were produced South of

the Sahara, well before European contact in the fifteenth century. Though, Znamierowski (1967), suggests that, the early man first used weaving process some 20,000 years ago, Hodge (1983), recalls that, weaving in Nigeria may have been two thousand years old and may have been based on the idea of mat making. Evolution of weaving in Nigeria could have been traced through archaeological discoveries in Eastern Nigeria, of textiles over a thousand years old, woven from Bast and Leaf fibres. Consequently, Okeke (1955), believes that among the earliest form of textile materials used by the Igbos was the `Aji' cloth, which was obtained by beating the bark of the `Aji' tree into soft matted pieces, and used as cloth. He claimed this to have preceded the knowledge of cotton spinning and weaving of cotton cloth.

Eicher (1976), in her own contention, has it that Kano, in the Northern part of Nigeria, had a reputation for the skill of its weavers (who were thought to be Hausa), as early as 1512 A.D. While Barth in 1851, observed dyed and woven cotton as the main products of Kano. On their own part, the Yorubas have long had a reputation for their weaving, and ample use of hand woven fabric for their own clothing.

In the sixteenth century, Yoruba and Benin cloths were praised for their quality and were sought by explorers in

trading vessels for trade with other African nations. As obtained in the description of their travels, the Lander brothers, John and Richard, reveal that in Iseyin area, and particularly in old Oyo, in the early nineteenth century, the arts of weaving, dyeing and spinning were being practised. Another observer states that, in the 1890s, the Yorubas are by custom a fully clothed mortal; and that it is considered in the highest degree unfashionable to appear in public without a complete covering of two or three ample and well-dyed cloths, draped around the body in not ungraceful folds. It was also observed and estimated that, over ninety-five per cent of Yoruba cloth consumption was hand-woven from locally grown cotton, which was hand-spun and hand-dyed, using natural dyes.

Although, weaving-craft is thought to have been brought down the trans-Sudan caravan routes from the North, its origin is obscure and conflicting. Wangboje (1968) opined that, the date of the introduction of weaving into Nigeria is uncertain, as there is no evidence of it at Nok, where terra-cotta heads were discovered by Bernard Fagg. Had woven pieces been found along with the heads, which proved to be the oldest form of sculpture in Africa, with radio carbon dating between 900 B.C., and 1200 A.D., intelligent guess could have been made as to the date of the introduction of weaving into Nigeria and possibly wherefrom.

In supporting the Northern origin of weaving craft in Nigeria, Adetoro (1984), deduced that, the art of weaving was first introduced to Northern Nigeria from across the Sahara, perhaps by immigrants from the decaying empire of Mali, where there was a large cotton industry in the fourteenth century. Also, DeNegri (1966), viewed strip weaving as, having spread South through Nigeria with Islam and becoming firmly established where ever that religion took a hold. On the contrary, Clarke (1936), contended that the Yoruba in the Western part of Nigeria have been used to broad loom weaving since their immigration to West Africa more than a thousand years ago.

Regardless of the conflicting reports on the place and time of the introduction of weaving craft into Nigeria, most scholars agree that weaving in Nigeria as well as in other parts of the world, is an ancient craft, the idea of which clearly preceded the loom by many thousands of years.

2.3 TYPE OF LOOMS, THEIR EVOLUTION, ORIGIN AND STRUCTURE

In its most basic form, the loom consists of a frame work to hold the warp yarns rigid, while the weft yarn is being interlaced. When weaving was done entirely by hand, rushes (semi rigid vegetable material), were laid length-wise on the ground and lifted alternately to allow the weft to be threaded across.

2.3.1 Evolution of the Loom

According to Held (1978), the first improvement on this system was a method of holding the warp yarns taut. She claims that, primitive weavers undoubtedly drove two stakes into the ground and stretched their warps between them. A variation on this simple device, she continues was the Solomon Islands hand loom, (see Figure-2.1), which was made up of slit pieces of wood held apart by two vertical wooden props, and tied at the ends to prevent further separation. Held (1978), reports that the vertical warp weighted loom was an out growth of the twining process (a non-loom technique). She contends that, it appeared first in Egypt during the second Millennium B.C., and was eventually adopted by the Swiss Lake Dwellers, the Greeks, the Romans, the Scandinavians and the Indians of North and South America. Supporting this view, Brostoff (1978), also states that the earliest Egyptian renderings depict both men and women at work on what appear to be simple vertical looms. The next known loom according to her is of Greek origin and seems to be comparable to that used in Ice-land (which Held, 1978 considered an eighteenth century version of the Greek warp weighted loom).

As evident in most literature reviewed, among the simplest of the horizontal looms is the back-strap loom, in which the warp yarns are held taut between a tree or other

fixed object and the body of the weaver. This type of loom is claimed to have been common among the Indians of Peru during the pre-Inca period; and still in use today by natives of South-east Asia and the Americans, including the Navajo of Arisona and New Mexico. Though, it was not known when it was developed, the horizontal ground loom is another type of loom which provides for a fixed support of both ends of the warp, thus, freeing the weaver physically from the loom. One version of this loom was the pit-loom, so called because it was designed to be placed over a pit dug in the ground, while the weaver sat on the ground at level with the loom. The weaver's feet, in the pit, operates the treadles. The pit looms were claimed to be used in India for weaving cotton.

Another type of the horizontal ground loom is the tripod loom, (see Figure-2.2), used in various parts of Africa for making narrow bands of cloth. Various authorities have it that the horizontal frame loom was known in ancient Egypt, but it may have been invented in China much earlier. Though, many refinements, structure wise, have been added over the centuries, in operating principle, the early horizontal frame loom was identical to the common floor looms used today all over the world. From several reports at the researchers disposal, it is convenient to deduce that throughout the whole world, two distinct types

AHMADU BELLO

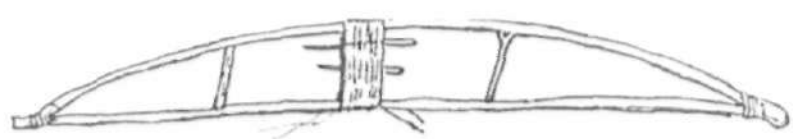


FIGURE - 2.1: The Solomon Island Hand Loom

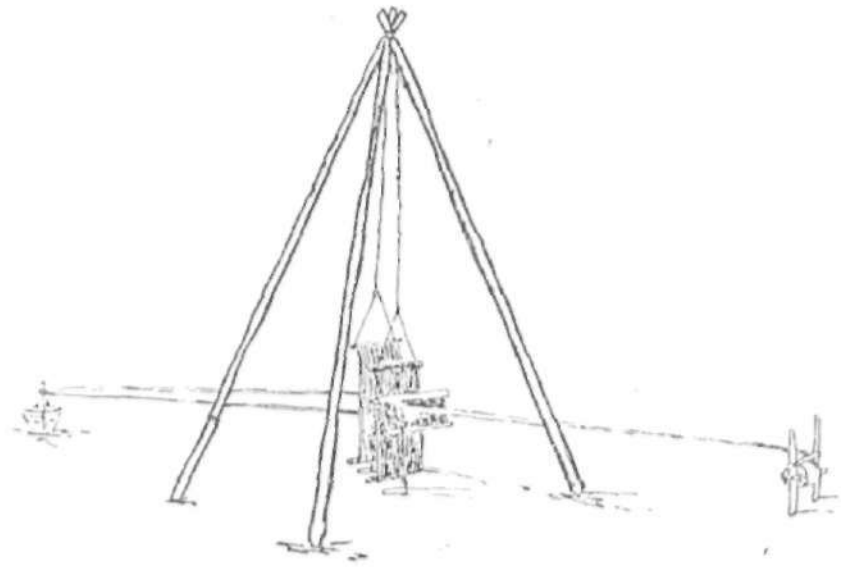


FIGURE - 2.2: The Tripod Loom

of basic looms can be identified - the vertical and horizontal looms.

2.3.2 Origin of the Indigenous Horizontal and Vertical Looms

Where, how and when the two types of looms were introduced into Nigeria remains a matter of speculation, surrounded by uncertainty. However, it is a general view that they have independent origin.

The origin of the horizontal looms is a matter of speculation as archaeology is still rather reticent on its development in Africa for that matter or its diffusion from another place. Some school of thought have it that, the horizontal loom evolved in West Africa, judging from an ancient proto-type related to today's Berber ground looms. Corroborating this view is the fact that substantial quantity of cloths, dating as far back as 1000 A.D., revealing many characteristics of the modern production of the West African narrow (horizontal) loom were not too long ago discovered in burial caves in the Bandiagara Cliffs in Mali, which as the crow-flies, is not too far from Kano in Nigeria. In their reports, Eicher (1976), and Boser (1972), believe that, narrow band loom (horizontal loom) was brought to West Africa from the East in the early centuries A.D., by a group of Semitic Syrians, who eventually became absorbed by the Fulani people. Thus, the heddle and treadle looms

(horizontal looms) became part of the Fulani craft heritage. Supporting this contention, Lamb and Holmes (1980), report that, the horizontal loom in Nigeria has a Northern origin as it was seen in sub-Sahara West Africa with the demand for cloth woven by the people living along the Southern edge of the desert, especially those in the neighbourhood of the Niger bend.

As for the vertical loom, some authorities have it that, it is an adaptation of the raffia loom used by men in Congo basin, while others are of the opinion that it originated from Syria and the Palestine area. If one should go by Clarke's (1936), contention that the Yorubas in the South-western part of Nigeria have been used to broad loom (vertical loom) weaving since their immigration to West Africa more than a thousand years ago, then Kent's (1971), view that this type of loom was brought across the desert and used by Hausa women before being later adopted by women in Southern Nigeria, contradicts the issue. However, based on records of various scholars, such as Okeke (1955), Poynor (1973), Afigbo (1973), Lamb and Holmes (1980), Akinwumi (1992), and Oguntona (1994), among others, there are good grounds for supposing that the indigenous vertical loom belongs to the Southern part of Nigeria, and the horizontal loom to the Northern part.

As demands for their products increase, Nigerian craft weavers are forced to alter their methods and improve their technique. They adopted new methods and tools when they thought these appropriate to their weaving craft. The diverse weaving population in the various geographical setting in Nigeria, developed or borrowed looms and weaving processes related to the natural resources available and made them part of their everyday lives. This phenomenon could be said to be an over-riding factor in the introduction of improved modern manual looms into the weaving craft industry in Nigeria.

Exactly when a particular improvement occurred is very hard to determine. However, it was conjectured that several weavers discussed some time-saving and product quality improving ideas, and later some inventive minds amongst them pursued the ideas and developed them. With so many ideas evolving at approximately the same time, within a few years of each other, it is most certainly difficult to determine the correct chronological order of their occurrence. However, Ali (1986), states that, the origin of contemporary manual looms could be traced back to the time weaving craft was incorporated into the curriculum of institutions of higher learning and vocational centres in Nigeria. According to Sandstrom (1985), Ada (1985), and Akinwumi (1995), weaving was introduced as a course in the

Textile Sections of the Department of Industrial Design, Ahmadu Bello University, Zaria, Nigeria; the University of Nigeria, Nsukka, and Yaba College of Technology, Yaba, Lagos, Nigeria in the 1970s. Stating further and citing Aba Textile Centre and Auchi Cooperative Weaving Centre, Ada (1985), recalls that, weaving on contemporary manual looms had being in existence since 1948. In his contribution to discuss on the use of contemporary looms among Nigeria craft weavers, Jegede (1970), reveals that, in 1964, the first weaving centre was set up in Okene by a male weaver, Mallam Yusuf Utohu, who introduced for the first time, in the whole of Ebira-land, large floor looms, with multiple harnesses and treadles. In his own report, Southern (1949), states that, whatever is the economic gains of the improvements in hand-weaving techniques, there can be no doubt that the introduction of improved, modern manual looms and spinning wheels have opened the eyes of Nigerian weavers to a different approach to one of man's oldest crafts.

2.3.3 Loom Structure

Traditionally, the narrow fabric (strip-cloth) weaving is carried out on the horizontal loom by men and boys - thus, its being referred to as men's looms. On the other hand, a comparatively wider fabric is woven on the vertical loom by women and girls - invariably its being commonly regarded as women's loom. However, in contemporary

time, while the products of each of the loom remain peculiar to type, the gender classification has become irrelevant. It is not uncommon to find both men and women weaving on anyone of the loom types in recent times.

Though the vertical looms, also known as the Broad loom, and the horizontal loom commonly referred to as the narrow band loom, can be found, in recent times, in almost all rural and urban settings in the country, where weaving thrives, - traditionally, some of their main location include; Abakaliki area, Akoko, Asaba area, Bida, Iseyin, Kano, Lokoja, Ndoki area, Nsukka area, Okene, Owo, Oyo, Yola, and Zaria among others.

2.3.3.1 Structure of the Vertical Loom

Various versions of the vertical loom are encountered as one moves from one locality to the other, in Nigeria. However, the similarity found in their structure and operation have strong correlation with the various interpretation and description given by many authorities.

As reported in various literature, the vertical looms (see Figure-2.3), consist in the main, of a square or rectangular frame, made from the mid-rib of raffia palm. For weaving to be conveniently and effectively carried out on the traditional vertical loom, the upper part of the

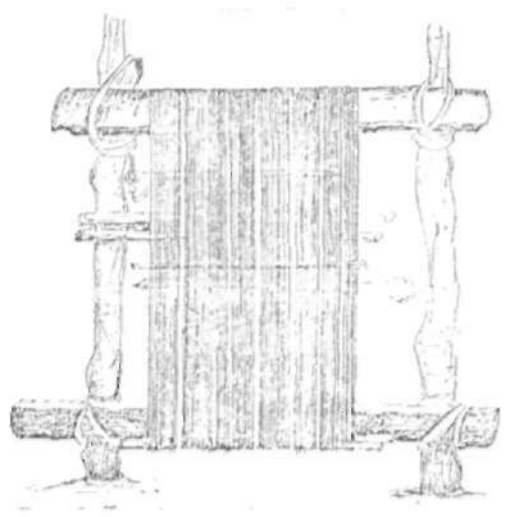


FIGURE - 2.3: Traditional Vertical Loom

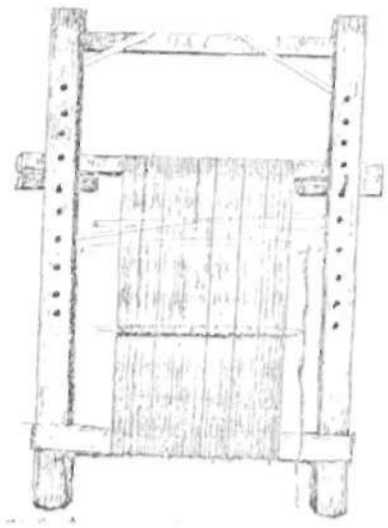


FIGURE - 2.4: A Carpentered Vertion of the Vertical Loom

frame has to be set against a wall, while the base of the two vertical parts of the frame need to be buried in a hole dug in the ground, for support. The frame also comprises sticks of varying sizes, stuck into a warp mounted on it. According to Lamb and Holmes (1980), at a glance, and viewed comparatively with the horizontal loom, the vertical loom appears simple. Whereas under closer observation, it is a most sophisticated piece of equipment, capable of weaving cloths with patterns of extra-ordinary complexity. It's operation demands great skill and experience.

Okeke (1955), has it on record that the two upright parts of the frame usually pass through holes, which are bored in the upper and lower horizontal beams - but some times the parts of the frame are merely lashed together - especially where the two upright parts are wooden poles or simply the trunks of small trees, other than the raffia midribs. It could be mis-leading to refer to any of the horizontal part of the frame as either the warp beam or the cloth beam, as variously reported. What obtains practically as gathered from participant observation of activities on the traditional vertical loom is that the warp is held taut between the upper and lower horizontal beams, while the woven fabric is continually pushed round the lower horizontal beam to the back of the loom. Inevitably, when the warp is woven out, the woven fabric is now held taut

between the upper and lower horizontal beams of the loom frame.

Given the on going, it is the researcher's view that neither of the two horizontal parts of the vertical loom frame should be referred to as either the warp or the cloth beam, as is obtainable on the horizontal loom. The researcher will therefore, like to state that, the vertical loom has neither a warp or cloth beam. Rather, it has two horizontal beams (top and bottom beams), usually made from the midribs of the raffia palm which provides rounded and completely smooth surface, over which the warp yarns and woven cloth can pass. The vertical loom also has no treadles. The heddle, consists of two, very thin strips of smooth surfaced cane, with spiral leashes inter-twined. Lease rods, usually made from raffia palm mid-rib, are essential accessories of the vertical loom.

In the opinion of Lamb and Holmes (1980), the components of indigenous vertical loom which includes; the heddle, supplementary heddles, the main shed sticks, supplementary shed sticks, the tenter, the shuttle, and the sword sticks, are often appearing somewhat improvised, but are more often than not suitable for the accomplishment of their respective task. They regard these components as demonstrating the availability of local materials which,

when properly selected in the construction of apparatus performs and generate output that can rival any of their kind anywhere else in the world.

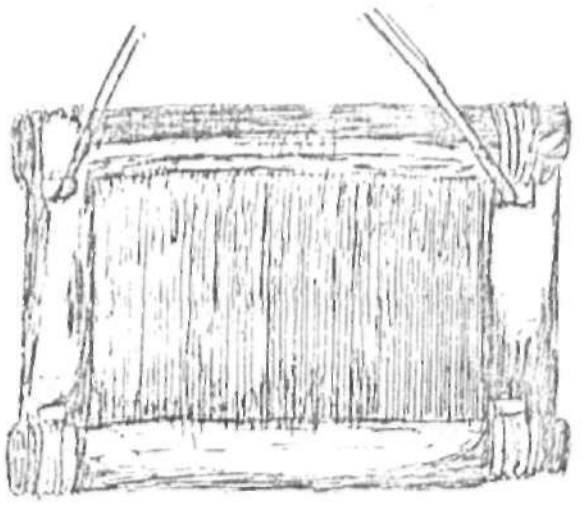
In recent times, vertical looms, made by carpenters (see Figure-2.4), are evident among craft weavers in Nigeria. Going by the record of Lamb and Holmes (1980), a new development in vertical loom weaving is a loom specially made by carpenters, so that it can easily be dismantled and moved from place to place. However, all enjoyed the great advantage of being easily mounted in a room with concrete floors, into which pits cannot be dug to support the uprights as required in the case of the traditional vertical loom. Also, according to Lamb and Holmes (1980), in contemporary period when more and more Nigerians, are moving about the country and living in non-traditional houses, the carpenter structured vertical looms are enjoying unprecedented acceptance and usage. It has enable weavers using the vertical loom to work far away from their traditional base, thereby, making it possible to locate them in places other than their customary regions. This, if the researcher may add, has helped in sustaining the revival of the craft, as many more people are not only being exposed to the craft, but their interest is being aroused as well.

The upright part of the frame of these new generation of vertical looms, as shown in Figure-2.4, usually have vertical row of holes, into which pegs can be driven to support the upper and lower horizontal beams in various positions. This makes it easily possible to adjust the dimension of the intended woven fabric.

2.3.3.2 Structure of the Horizontal Loom

The horizontal loom, otherwise known as the narrow band loom or men's loom, is a treadle loom. There are many versions of the loom. According to Adetoro (1995), the portable type and its variation contain heddles, beater, pulleys, two foot treadles and loops (see Figure-2.5b). In his own contribution, Dodwell (1955), views the horizontal loom as, both a simple and cheap device, which represents a stage of considerable development over the primitive forms of loom, in that the warp is of considerable length and, at least, two heddles are used, with a reed (see Figure-2.5a), for beating-up the cloth.

Eicher (1976), points out that there is variation in the structure of the horizontal loom used by Yoruba men and the Nupe. According to her, the structure of the traditional Yoruba horizontal loom permits the weavers to sit on a bench or ledge with their feet on the ground, working the treadles. Whereas, the Nupe version only allows



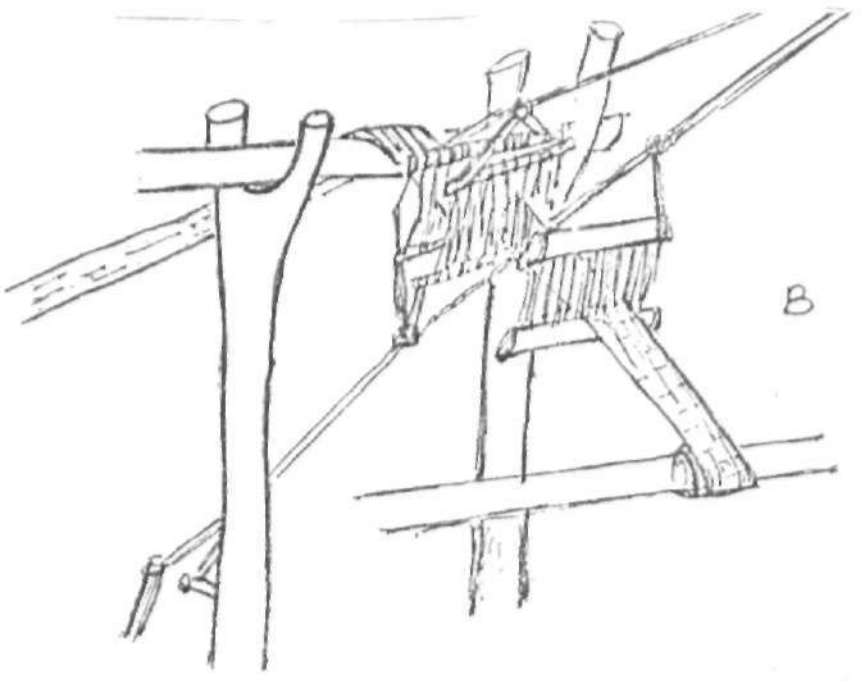


FIGURE - 2.5(a): Typical Traditional Horizontal Loom Beater

(b): Traditional Horizontal Loom

the weavers to sit on a mat spread on the ground, with their legs stretched out in front of them. Based on the record of Lamb and Holmes (1980), the use of a pole may not be necessary in the Hausa version of the horizontal loom, when installed in the house.

As variously reported in most of the related literature reviewed, the horizontal looms are usually installed in a shed located in the court-yard or an open space, where the warp can be stretched out and the necessary cords of the loom suspended on the rafters of the shed. Lamb and Holmes (1980) recall that, in a Hausa version of the horizontal loom, the heddles and beater can be suspended by cord attached to the wall behind and above the weavers head. The shuttle, back-rest, breast beam and a specially made wooden sledge, are other necessary accessories of the loom. Following the record of Eicher (1976), in another version of the horizontal loom (Hausa Loom), the breast beam can be suspended by means of a pair of cords attached to the pegs in the ground, located behind the weaver. The warp bundle in most cases is usually placed on the wooden sledge, which is weighted down by a large stone to provide the required tension, and is dragged closer to the weaver as weaving progresses, and the woven fabric is wound onto the breast or cloth beam.

More often than not, the harnesses (heddles attached to a top and bottom wooden rods), consist of heddles made of relatively coarse, string-like, cotton yarns, either hand or machine spun. The beater, in most cases, is rectangular in shape, with the side member's thickness comparable to that of the bowl and top member. The reed, which is an integral part of the beater, consists of numerous thin, smooth bamboo strips. The space between adjacent strips (dents) are inadvertently uneven across the width of the beater. Usually, the reed dentage averages eleven dents per inch.

Like it is in the instance of the vertical loom, Lamb and Holmes (1980), have it on record, as a new development, the existence of a carpenter made-frame version of the horizontal loom (see Figure-2.8). According to them the forms of pulley, beater, harnesses, shuttle, back-rest, breast beam, and drag-sledge of the loom are similar to those employed on the traditional horizontal loom - the main difference being that these parts are suspended from a cross bar placed at the top of the carpenter frame; which is structured to include provision for the support of both the back-rest and breast beam; and a seat for the weaver (as shown in Figure-2.8). Almost for the same reasons advanced for the carpenter made vertical looms, the frame version of

the horizontal loom has gained unprecedented acceptance and usage among craft weavers in most part of Nigeria.

A comparatively complex and sturdier frame work version of the horizontal loom (see Figure-2.6), is evident among craft weavers. Southern (1949), reports the introduction of this type of loom into Nigeria weaving craft industry in the 1940s. Brown (1978), describes the loom as, a contemporary manual loom, consisting of a sturdy frame work that stands on the floor, with a warp beam at the back and a cloth beam at the front. Fitted at one end of each of the beam, is a toothed ratchet wheel and, a catch appropriately placed, to prevent the beams from unwinding pre-maturely. Close to the centre of the frame, provision is made for the suspension of not less than eight harnesses or shafts. Some distance away, in front of the shafts, a metal reed, appearing like a steel comb, is located. It is held in a rectangular frame, which pivots from the bottom or top of the loom and serves as the beater. At the back and front of the loom are bars connecting the bottom of the two side parts of the frame. To either of these bars is fitted, two brackets, which support an iron rod, on which the treadles (pedals) are slotted. Each treadle has holes down the centre to facilitate its connection to the bottom slate of the appropriate shaft. The earlier version of this sturdy frame type of horizontal loom had no `lams'. This

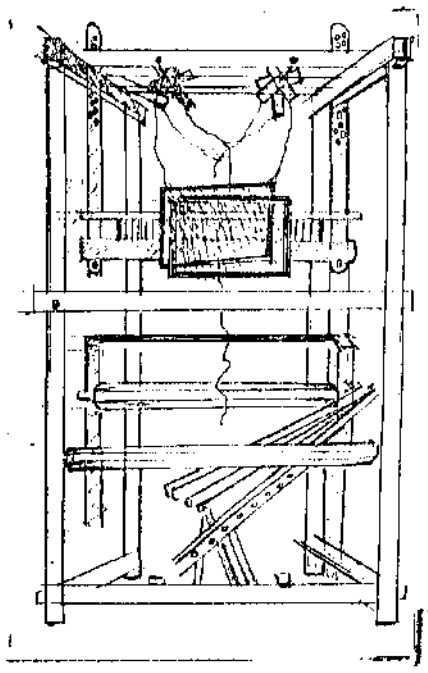


FIGURE - 2.6: Back View of a Comparative Complex and Sturdier Frame Work Version of the Horizontal Loom

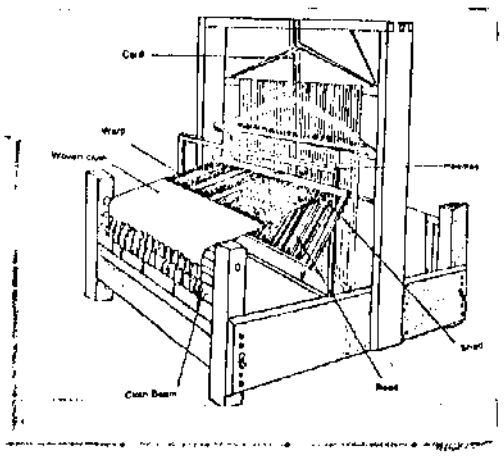


FIGURE - 2.7: A Table Loom

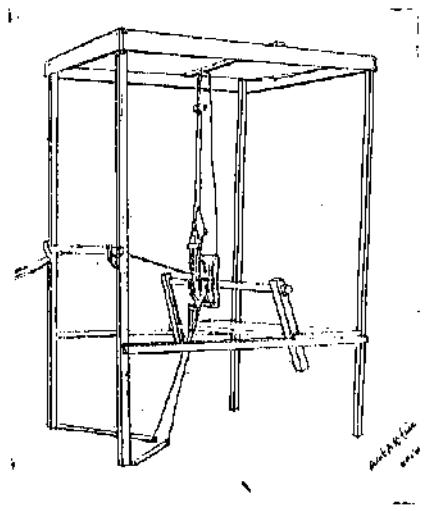


FIGURE - 2.8: L.H.S. View of the Carpentered Frame Horizontal Loom

means that the shafts were tied directly to the pedals. The provision of lams in subsequent models simplify the tying-up, and enabled the weaver to get a direct pull from the centre of the shaft, which result in a better shed formation.

Going by the record of Simpson and Weir (1971), the lams, which are similar in appearance to the pedals, with holes down the centre, but are narrower, enable a pedal to be connected to more than one shaft, thereby widening the design capability of the loom. In connecting a pedal to a shaft, through the lam, a string is passed through one of the several holes at the centre of the lam, which is in line with the centre of the shaft. This string is attached to a special non-slip loop suspended from the bottom slate of each shaft. Since each lam extends across each pedal, definitely, a series of holes on each lam is in line with those on each pedals, and through these the strings can pass, and be tied to the loop extending upward, and passing through the hole in the pedal.

Actually, the sturdy frame work version of horizontal loom, in the researcher's opinion, can be regarded as an indigenous version of the fly-shuttle manual loom, invented by John Kay in 1733. The loom with its

system of ropes, lams, shafts, pedals, and beater, is yet to be widely in use among craft-weavers in Nigeria. Presently, it can be found in weaving centres in Ekiti State, Ilesha in Osun State, Gwarzo in Kano State, Okene in Kogi State, and some of our tertiary institutions - for example, Yaba College of Technology, Yaba, Lagos State. Renne (1992), notes that, of the twenty-seven weavers interviewed in Ekiti, virtually all used some sort of multi-harness treadle looms. According to her, 30 per cent of these weaver - owners wove on large European style floor looms, of the type introduced by the colonial officials at the Textile Centre, located at Ado-Ekiti; another 63 per cent wove on narrow-strip treadle looms, which had been adapted with a floor loom frame, while it retains the drag-stone tension device, associated with the basic traditional horizontal double-harness treadle loom.

In addition to these carpenter frame-work horizontal looms, models of floor looms were imported into the country from India, Britain and America, to mention but few. The imported looms found in institutions of higher learning such as Ahmadu Bello University, Zaria; Auchi Polytechnic, Auchi; Institute of Management and Technology, Enugu and Yaba College of Technology, Yaba, etc , include; the counter-balance, the Jack loom, Danish loom and Elex loom. Simpson and Weir (1971), state that, these looms, in

the recent revival of crafts in Europe, are a definite link with the past, and have played their part in the history of inventions and occupation in that part of the world. According to them, the looms are large, and difficult for a weaver to accommodate, unless plenty of space is available.

Concerning the table loom (see Figure-2.7), which also is one of the imported looms in our tertiary institutions, authorities have it that, it does practically the same work as the large floor looms, but on a smaller scale. Simpson and Weir (1971), along with other scholars claim that, owing to the more convenient size and lower cost of the table loom, it is within the reach of many more people in Europe, who are interested in the craft of weaving. They further stated that, the construction of the table loom is much simpler than that of the large treadle looms. Though, the working principles are similar, the main difference between them is in the method of working the shafts.

The structure of a typical table loom (see Figure-2.7), according to Simpson and Weir (1971), and Chetwynd (1977), consists of the following principal parts; front roller or cloth beam, back roller or warp beam, heddles, which are made of wire or string (with a hole in the centre, through which the warp yarns are drawn); heddle frames or

shafts or harnesses (four in most cases, consisting of metal rods on which each set of heddle is mounted, and suspended from the top of the loom); Reed and Batten or beater (used for regulating the warp yarns and beating-up the weft); shed sticks (mostly two, smooth sticks, with holes at the ends, used for preserving the cross in the warp). These and other fixtures such as the toothed ratchet wheels and catches, made the table loom what it is - an ideal weaving device.

Simpson and Weir (1971), view the lifting device for the shaft as the main thing to be considered before embarking on the construction of a table loom. Accordin to them, many original methods that have been adopted for this include; a leather strap or a piece of brass chain, working through a slot in the top-cross beam, and fastening to a hook to hold the shafts stationary, whilst the shuttle is thrown. Various other practical idea will occur to the weaver - they opine.

Adeyi and Usman (1992), Osinowo (1994), and Akinsanya (1997), among others, have attempted to locally fabricate one type or the other of the table loom. While their various efforts are appreciably recognised, in most of the cases, the looms are bedeviled by structural defect nd precision, which rendered some inadequate and other nonfunctional.

2.4 WEAVING PROCESS AND TECHNIQUE

In principle the weaving process on both the traditional looms (vertical and horizontal looms), and the contemporary manual looms is basically the same. It involves the three primary motions of weaving, which are; shedding, picking and beating-up. However, the manner in which these motions are accomplished on the various types of looms, informed the variation in their weaving techniques.

Weaving process is as varied as locality changes, although, one can still find a common language of technique being practised across the country - opined Adetoro (1984). Weaving process depends on interlacing the vertical yarns known as warp or end, with the horizontal yarns, commonly referred to as weft or pick. The manner in which the sets of yarns are interlaced affects the characteristics of the resultant cloth. According to Oguntona (1994), a specific manner of interlacing is known as weave, e.g., plain, twill, satin and sateen weaves, and many other variations. Grosicki (1975), explains that, weaving process itself consists of three basic operations, which form a continuous cycle, whether in the simplest hand loom. He enumerates and explains these basic operations as follows:

(a) Shedding

It involves the separation of the warp sheet to produce a tunnel - like path (shed), through which the shuttle is transversed to lay the weft for a given interlacing. The creation of the `shed' is achieved by threading each warp (`End'), through an eye of the heddle (a process known as drawing-in or drafting), and raising or lowering the heddle, depending on whether it is required to lift the `End' above the weft, or to keep it below the weft during `picking'.

(b) Picking

Picking is the laying of the weft (`Pick'), right across the warp, by transversing the shuttle through the `shed'.

(c) Beating-Up

This is the pushing or crowding of the newly inser.ed weft into the woven fabric, at a point known as the cloth-fell. Beating-up is accomplished with the aid of the beater, which consists of the reed and the reed-frame.

The `Picking' and `Beating-Up' operations are fixed, no matter what type of fabric is being produced; but the `Shedding' motion is variable and can be described as the

heart of weaving, because it is here that the nature of the interlacing (weave or design), is decided - Grosicki (1975).

2.4.1 Weaving Technique on the Vertical Loom

In the traditional setting, weaving on the vertical loom entails four basic stages, which include; winding, warping, hecking, and weaving.

2.4.1.1 Winding

Jegede (1970), asserts that it is a common practice, in the case of hand spun yarn to unwind the yarn from the spindle onto bobbins or hanks. The bobbins are used for warping directly on the loom. Whereas hank winding becomes necessary when the yarn has to be dyed before it is used for warping. In this instance, the yarn is first wound into hanks, which are dyed, dried and rewound unto bobbins for warping.

Hanks can be wound by simply fixing two short poles into the ground, at any desired distance apart, and winding the yarn round them until the size of hank required is obtained. On the other hand, bobbins are wound on spools, which take the form of a large spindle.

2.4.1.2 Warping

Since most available literature for review seems to have given a cursory and inexplicit description of the

warping process on the vertical loom, the researcher finds it expedient to provide information in this regard, as obtained from participant observation of activities on vertical loom weaving.

Warping, which involves the unwinding of yarn from bobbin(s) and stretching it side-by-side, parallel to one another, is carried out in vertical loom weaving as a continuous process. It entails the winding of yarn round the top and bottom horizontal beams of the loom frame. The top beam is fixed, while the bottom beam, which is adjustable, is securely lashed with a cord to the two vertical parts of the loom frame. To commence warping, two shed sticks or lease rods, a little wider than the width of the frame, are placed half-way across the frame and held in position by two twisted looped cords, fastened to the top and bottom beams, on the left hand side of the frame. The loose end of the yarn to be warped is tied to the bottom beam and stretched upwards to pass over the lower and under the upper lease rods, before being taken over the top beam, through the back of the loom frame and then, round the bottom beam. This completes the first warp-end. On its upward stretch for the second warp-end, the yarn is passed under the lower and over the upper lease rods, then the usual route is followed back to the bottom beam. This sequence is repeated until the desired warp width is

attained. In effect, all the crossings are on the side of the warp facing the weaver - as the warp is already divided into two (the upper and lower-warp sheets).

A warp consisting of a plain background will make, so to speak, a single spiral. However, to introduce warp stripes (pattern), the process of warping must be interrupted so that yarn of one colour can be replaced by-yarn of another, the two yarns being tied together so as not to break the continuity of the spiral. The end result is a warp which looks very much like a wide endless belt, running round the horizontal beams, with all the shed sticks and other weaving devices fixed into the front side, facing the weaver.

2.4.1.3 Hecking

Hecking is an operation, carried out on the vertical loom, which results in the simultaneous formation of the heddle and the enclosure of a set of warp-ends by the loops of the heddle. According to Okeke (1955), the heddle consists of two thin flexible and smooth pieces of cane, with spiral leashes interlooped.

The mounting of each warp for a new weaving in the vertical loom inevitably, involves new hecking (leashing or heddle-making) operation and this can only be done after warping-up has otherwise been completed. For hecking,

according to Lamb and Holmes (1980), the following are required; a very flexible length of raffia palm rib, to serve as a heddle stick (and of course, of a length greater than the warp width), and a short rod, usually of bamboo, with a length of cord attached to one end of it, along which the heddle leashes, as they are made, will be threaded. Sometimes, instead of this cord, a second heddle rod can be used. A further length of string or twine is required for creating the leashes or the heddle.

Theoretically, heddle-making or hecking, on the vertical loom may be considered a simple task. Whereas, practically, it calls for great skill and experience. In essence, hecking is to create a contrivance of double loops, similar to the figures of eight, out of the string or twine, with one loop running round a firm support of some kind and the other loop going round every alternative warp-end, such that when the whole assembly is pulled away from the loom, it takes the alternate warp-ends with it - thus, creating a shed. The heddle rod provides the firm support, the backbone as it were, of the heddle, yet it is flexible enough to permit the heddle to bend in all three dimensions during the course of operation. The bamboo tool is a convenient device to help in the making of loops round the warp and heddle rod. The loops are first made to include the bamboo tool. At convenient intervals, the accumulated

loops are pushed off the bamboo tool unto the cord, and new series of loops begun.

When completed, the heddles consist of double spiral. The upper loops of this spiral are tightly wound around the heddle rod. Whereas the lower loops (through which alternate warp-ends pass), though loose, are dimensionally secure. This is because of the cord core or second heddle rod, which supports them. It is important to point out that the quality of the fabric woven with the aid of this device will depend, very much on the regularity of the loops and the manner in which they are attached to the heddle rod or rods.

2.4.1.4 Weaving

On the vertical loom, weaving begins with the creation of a shed by means of the heddle, which is pulled away from the warp towards the weaver. The sword stick is first used to help separate the two warp sheets and then, it is carefully inserted into the shed. When the sword stick is through the shed, it is turned on edge to help clear and keep the shed open, while the shuttle is passed through, to effect the `picking' motion. To complete the sequence, the sword stick is used to beat down the inserted weft into the web, before it is withdrawn. The counter shed is then made

by pulling down, towards the heddle, the main shed rod, while the other shed rod, in swift brushing motion, is pulled across the surface of the warp (the purpose being to help separate the two warp sheets), thereby creating the counter shed.

As this sequence is repeated, Okeke (1955), asserts, that weaving proceeds from below and progresses upward. On reaching a limit convenient for the weaver, the warp-ends are slackened by undoing the cords with which the lower beam is lashed to the frame of the loom. This enable the woven fabric to be pushed to the back of the loom. The lower beam is then lashed again to the frame of the loom, and weaving continues. At the completion of weaving, the gap between the beginning and the end of the web is on the front side of the loom, at a point more or less mid-way between the two horizontal beams.

The weaving of inlay-weft or inlay-floats involves the use of an extra main shed rod, and a number of supplementary heddles (or extra shed rod), which are made in the same way as the main heddle. These supplementary heddles are always fixed to the front warp-ends of the first shed. Separate shuttles are used, and in the case of float patterns, small bobbins can be used as shuttles or the yarn can be inserted by hand.

In Nigeria, like in any other part of the world, the time taken to weave a cloth on the vertical loom varies from place to place, weaver to weaver, and kind of cloth to kind of cloth. Based on available records and preliminary investigation conducted, it usually takes a skilled Nigeria weaver a day to warp-up and heck the vertical loom. It may take a further two days to complete the weaving of a simple 'wrapper-cloth'. A more complicated warp pattern may take five days or more. Whereas, the most elaborate design, using the finest of yarn, may involve a weaving process lasting two weeks or more. Evidently, weaving on the vertical loom, is comparatively a slower process and can thus, be regarded as less economically rewarding.

This fact has been advanced, by some scholars as one, among other reasons, why vertical loom weaving has been on the decline, despite the resurgence of hand-weaving in Nigeria. Renne (1992) reports that, on the return of hand-weaving, after a period of decline, weavers (young women) did not use vertical single-heddle looms, which were considered slower to weave on than the horizontal multi-heddle treadle looms, and hence less economically rewarding. This trend (i.e., decline in vertical loom weaving), if not checked, may eventually lead to the slipping into oblivion, of vertical loom weaving, and taking with it one of Nigeria's valuable cultural heritage.

2.4.2 Weaving Technique on Horizontal Loom

From several reports and information gathered during participant observation, weaving activity on the horizontal loom, particularly among the Yorubas, can conveniently be regarded as involving six major stages, which are; starching or sizing (Owu fifo), yarn winding (Owu kika), warping (Owu tita), warp patterning (Owu yiya), drawing-in, through the heddles and reed, (Owu riri), and weaving (Aso hihun). Perhaps, with the exception of sizing, the other operations are fairly characteristic of the general steps in the weaving technique on narrow band looms across the country.

2.4.2.1 Starching or Sizing

It involves the immersion and gentle agitation of hanks of cotton yarn in starchy solution, contained in a bucket or bowl, and after which the excess solution is gently squeezed out, and the undesolved particles (lumps), of the starchy substance are shaken off and the hanks hung to dry.

There is the claim, mostly among Yoruba weavers, that hand spun cotton yarns, and even the factory made ones, are not strong enough to withstand the more vigorous agitation and tension they are subjected to when used on the horizontal loom. Thus, in order to strengthen the yarn, it is treated with starchy substance in aqueous solution,

before using it for weaving. The sizing of cotton yarn for both warp and weft, among the Yorubas, can be appreciated, in its contribution to the characteristics `handle' or `hand' (the subjective assessment of a textile material obtained from the sense of touch), peculiar to Aso-Oke (a Yoruba traditional fabric, woven on the horizontal loom).

In most traditional setting, starchy substance such as `Eba' (made from Cassava grains), and `Eko' (a product of Corn- flour), among others, are used for sizing hanks of cotton yarns. In some weaving centres and tertiary institutions in the country, experiments carried out have revealed that starch extracted from processed cassava tuber, yields better result, if properly handled.

It is pertinent to point out that with the use of cotton-blends and purely synthetic fibre-yarns for weaving on the horizontal loom, the sizing operation, even among the Yorubas, has become optional.

2.4.2.2 Winding

Simply put, is the transfer of yarn from one package form unto another. The traditional hand-winder usually and most generally takes the form of something like an inverted conical basket (see Figure 2.9), rotating on a stick supported by a beer bottle or any other suitable stand. Sometime, in place of this device, is a simple

revolving reel (see Figure-2.11b), with a peg located at each end of the wooden crossbar. These devices are used in conjunction with a large spindle-like tool (Figure-2.11a).

In using these contrivance, yarn is wound unto a spool, or other suitable package, by spreading a required number of hanks or skein around the inverted conical basket or the four pegs of the simple revolving reel. The free ends of yarn are withdrawn from the hank or skein and attached to a spool mounted on the large spindle like-tool. As the tool is skillfully spun, a simultaneous unwinding and winding of yarns from the hank or skein, onto the spool, takes place.

Many other devices have been introduced to quicken the winding operation. Both manual and electrically powered devices are now available. A modern manual yarn winder, commonly in use, according to Jegede (1970), consists of a bicycle wheel mounted on a wooden frame, and powered by pedalling system (see Figure-2.10). In this instance the hanks of yarn (two in the case of warp, and four in the case of weft), are mounted on a cone-like structure, pivoted on a stand, the free ends from the hanks are then withdrawn and attached to a package (bobbin) placed on the winder. As pedalling of the winder is commenced, the reel-like device, on which the hanks are mounted, is set in motion, rotat_ng

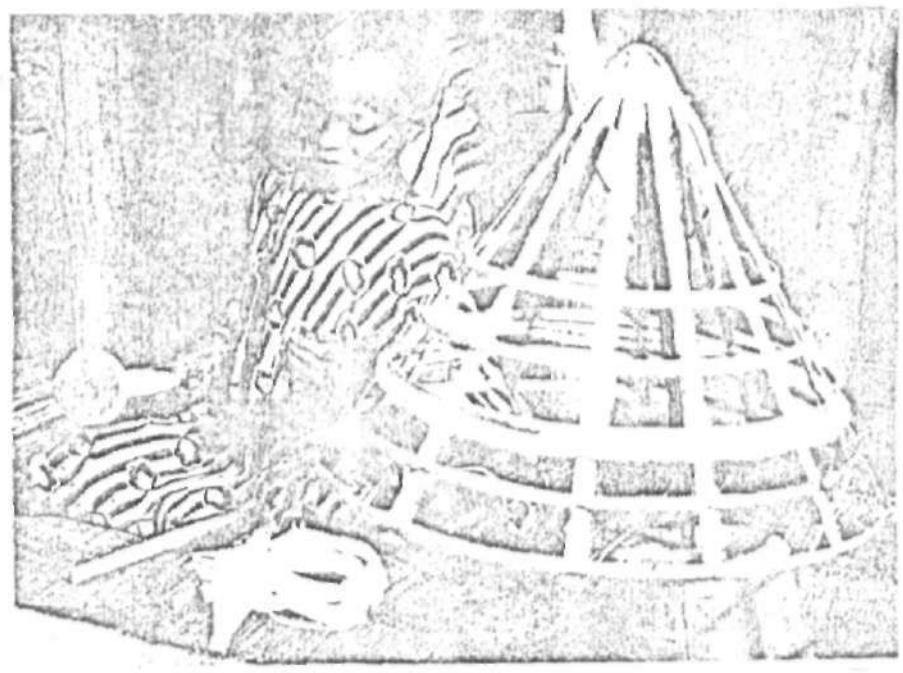


FIGURE - 2.9: Yarn Winding Onto Spool Using the Inverted Conical Basket-Like Traditional Winding

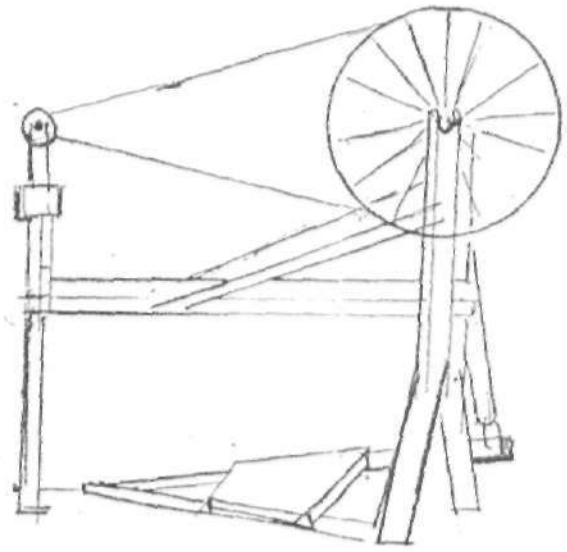
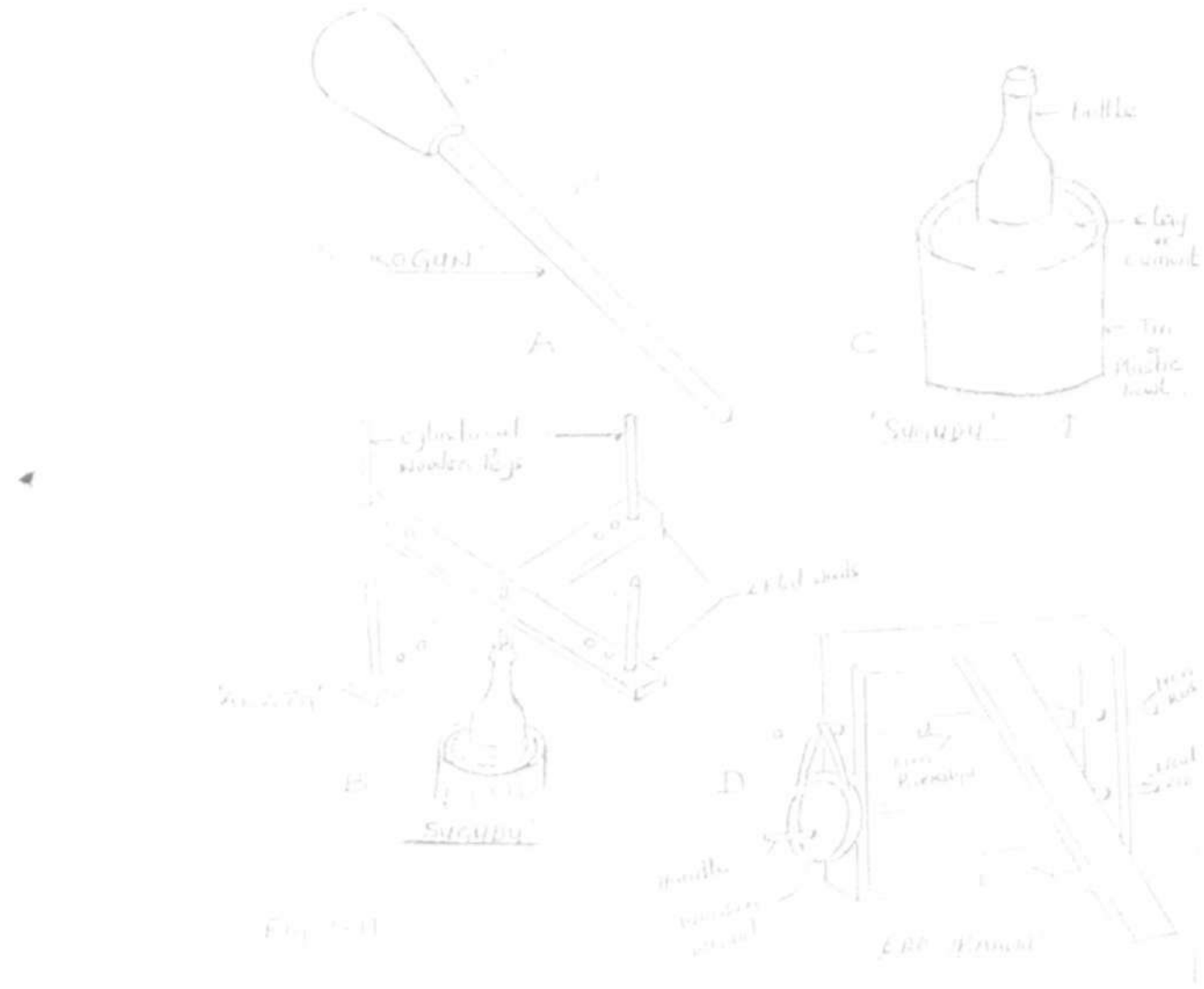


FIGURE - 2.10: L.H.S. of a Package Winder Consisting of a Bicycle Wheel Mounted on a Wooden Frame and Powered by Pedaling System



to warping yarn from the cones and reeling it onto the package on the winder at a comparatively faster rate than the traditional hand winder. Of greater speed is the electrically powered winder, which operates at about 1600 - 2,200 r.p.m.

2.1.2.2 Warping

At it relates to weaving on the horizontal loom, warping operation demands the pre-knowledge of the warp width and warp spacing, as these parameters determine the total number of 'ends' to be warped. Eicher (1976), has it that the width of the cloth woven on the horizontal loom varies from two to eleven inches. According to her, the Yoruba's usually have their strips between four and five inches wide, the Nupe and Igbira varies between six and eleven inches, Kanuri strips count out between six and eleven inches wide and the Hausa have theirs to be five inches wide. In their own report, Lamb and Holmes (1980) assert that, dimension of the fabric woven on the Yoruba horizontal loom allows for a total of some 324 warp ends (or 72 e.p.i). Stating further, they opined that, if hand spun, the warp yarns is usually single strand, but if machine - spun yarn is used, it is usually a two ply strand.

Going by Lamb and Holmes (1980), as well as reports from other authorities, warping up in Yoruba land

lengths and numbers of rows are possible). On completion, the warp is carefully wound into an elliptical bundle, ready for mounting on the drag stone sledge (Okuku).

2.4.2.4 Warp Patterning

In the case of a strip patterned warp, comprising of, say two colours, the total warp-ends of one colour is made before the other colour is warped directly on it, around the iron pegs. When complete and wound into an elliptical bundle, the apprentice will then patiently and sequentially separate the colours in the warp as per the dictate of the warp strips pattern required in the woven fabric.

When warp is made on a warping mill (see Figure-2.13), warp patterning, as a separate operation, becomes unnecessary, as it is possible to produce a patterned warp directly on the mill. According to Jegede (1970), the warping mill is a modern device, entirely made of hard wood, perfectly smoothed, and rigidly fitted. It consists of a large skeletal reel (generally five to six yards in circumference); a bobbin frame (that could contain between seventy-two and eighty bobbin), and two frame stands (for holding in place the spreader-reed and the V-reed). The spreader-reed is used for spreading out the yarns to the required warp-spacing (or e.p.i); while the V-reed is for



FIGURE - 2.12: Warping for the Traditional Horizontal Loom

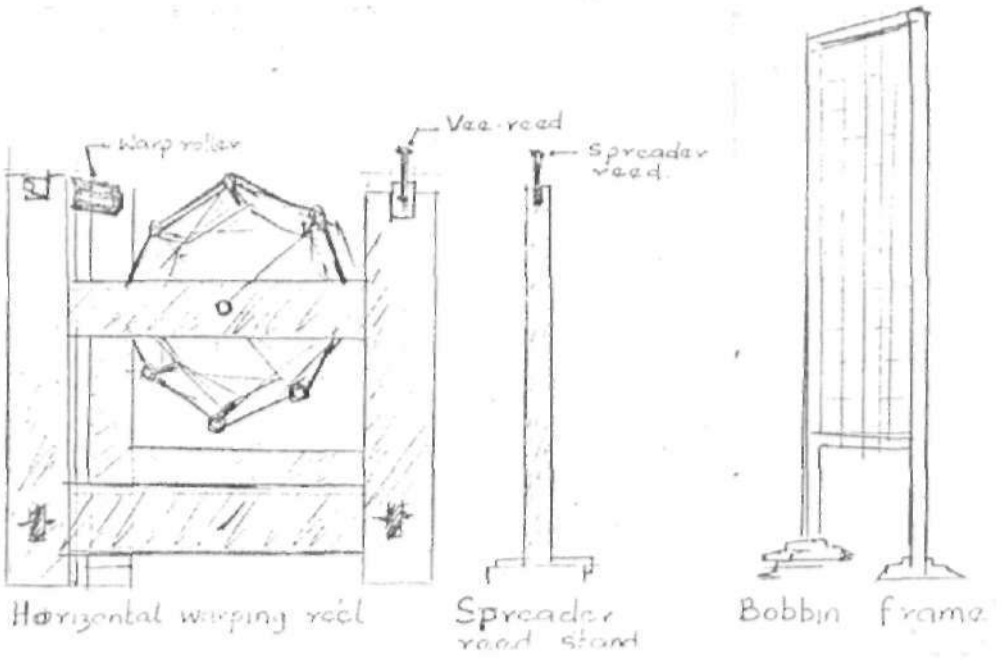


FIGURE - 2.13: R.H.S. View of a Complete Setting of the Warping Mill

creating the crossing or lease in the warp. Considering the limited capacity of the bobbin frame, a wide warp cannot be made at once. This could only be achieved by producing a section of the warp, containing the total warp length, and several of this section that makes up the total warp width, are wound side-by-side each other on the reel.

2.4.2.5 Drawing-in (through the heddle and reed)

This again is an operation usually entrusted to knowledgeable apprentice. In its simplest form (in the case of a loom already in use), it entails the tying of the free ends of the new warp to the remnants of the previous warp, which have been left running through heddles and reed. This is made possible because of the standardised fabric width (with its attendant total number of ends in the warp), and the fact that the basic background structure of the fabrics woven on the traditional horizontal loom is achieved by the use of a plain weave element - while patterns or ornamentations, when desired, are created on the background weave, employing supplementary heddles and in-lay wefts.

Alternatively, for a newly set-up loom, the drawing-in process (through the heddles and the reed dents), requires a sequential selection of the warp (making sure that the warp alignment is maintained), and passing it

individually through each heddle. The heddles on the traditional horizontal loom (see Figure-2.5b), consist of two inter-locked loops of twine, fastened to a top and bottom cylindrical-shaped wooden rods. Contrarily, the structure of the heddles on the floor and table looms (see Figures 2.6 and 2.7), exhibits centrally placed holes - "heddle-eyes".

Giving the structure of the heddles on the traditional horizontal loom, the warp is drafted by inter passing them, individually, between the upper and lower loops of each heddle, at the point, where the loops are inter-locked. Thereafter, the warp is passed through the reed dents, taking cognizance of the warp density and the reed dentage. Supposing the warp density is 72 e.p.i., and the reed dentage is 11 d.p.i., then the most appropriate denting process (i.e., the order of passing the warp through the reed dents), is 7 e.p.i., alternated by 6 e.p.i. Evidently, six of the reed d.p.i., will contain 7 ends each, while five will contain 6 ends each.

On completion of the denting process, the warp is then tied to the cloth beam apron (a contraption of a cylindrical-shaped wood with cord), attached to the breast beam. The warp is then ready for weaving.

2.4.2.6 Weaving

On the horizontal loom, weaving is usually executed by the weavers feet pressing the pedals or treadles alternatively, thereby manipulating the heddles, which are connected to a pulley, suspended from the rafter of the weavers shed or the top of the loom frame as the case may be. Adetoro (1975), states that, the alternating pedalling of the treadles creates the shed, through which the weft passes. He went further to assert that the tossing of the boat-shaped shuttle from one hand to the other creates the woven cloth. According to him, as each sequence (`shedding' and `picking') is completed, the weft is packed with the use of the beater, into the woven web; and as weaving progresses, the warp which is usually stretched some considerable distance in front of the weaver, and kept taut with the support of a heavy stone is dragged closer to the weaver. Lamb and Holmes (1980), contend that, in place of the short pedals, toe grips, made from discs of calabash, are sometimes used to work the pair of heddles on the horizontal looms.

Most of the fabrics woven on the horizontal loom are warp faced (i.e., dense warp or a crowded warp, which allows the warp pattern to dominate the face of the fabric). As a result, the weft yarns, which are usually coarser than the warp yarns, are concealed by the dense warp. The weft-

pick is usually in the region of 32 p.p.i. However, weaver controlled designs are woven through the manipulation of the heddle; and the use of supplementary heddles and in-lay wefts. These patterns could be geometrical, diagonal, zig-zag, stylised human and animal forms, as well as other desired patterns. Supporting the views of other scholars, Eicher (1976), states that warp stripe pattern is most frequently found in narrow band cloth, but asymmetrical pattern are slightly more prevalent than the others - symmetrical, weft-strips, weft-in-lay, etc.

The basic ground pattern, particularly in Yoruba weaving, achieved by warp colour alignments, is very similar to that used by the Nupe in Nigeria, the Fon in the Republic of Benin, the Ewe and Asante in Ghana and the Mossi in Upper Volta. Like these other people, Lamb and Holmes (1980), opine that, the Yorubas tend to use the background pattern as the basis for the naming of cloth. According to them, some of the other warp striped patterns of basic colours from these various groups are very hard to distinguish one from the other. Whereas the Yorubas use three main methods of patterning, which serve to distinguish their weaving easily enough from that of other people. These are; the use of holes, the use of in-lay floats, which may appear on one or both sides of the cloth; and the distinctive use of 'Ikat'.

With the exclusion of the sizing operation and the inclusion of warp-spreading process, weaving activities on contemporary horizontal loom and the traditional type are virtually the same.

When mounting the warp on the contemporary horizontal looms (floor looms and table looms, Figures 2.6 and 2.7), it is necessary, most especially when warping is carried out on devices (see Figures 2.14a and 2.14c), other than the warping mill, (see Figure-2.13), to spread out the warp to the required width, using a raddle (a com-like, wooden device, similar to the reed). It is only after this has been done that the warp, stretched out taut, can be wound onto a roller or warp beam, usually located at the back of the loom.

Thereafter, the free ends of the warp are sequentially selected, (being careful not to mix-up the warp alignment), and drawn through the heddles, following a pre-determined order (draft). The warp-ends are also drawn through the reed, following the dictate of the warp-spacing (e.p.i), in relation to the reed dentage. Having done this, the free ends of the warp are then tied to the cloth roller or beam, located at the front of the loom. The warp is kept taut by the toothed ratchet wheel and catch, provided on the looms.

Warping Devices for Contemporary Looms

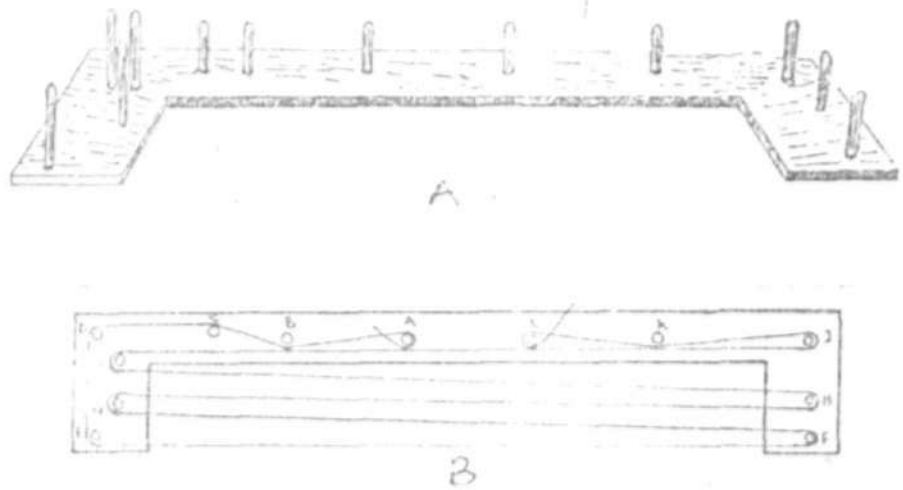


FIGURE - 2.14(a): Warping Board

(b): Warping Board Showing Laid Warp

(c): Vertical Warping Reel

Weaving, on contemporary horizontal looms entails the alternate pedalling of the treadles (floor looms), or the pulling or depression of handcords or lever (table loom), in order to create shed, through which wefts pass. The weft is usually laid across the warp, through the shed, with the aid of shuttle (which comes in various forms, shapes and sizes), and pushed or beaten-up into the `cloth-fell' with the aid of the beater.

Unlike the traditional horizontal loom, loom controlled weaves (designs or patterns) are quite possible on the contemporary horizontal looms, through the various manipulations of the shafts which are usually more than two in number.

2.5 RAW MATERIALS FOR WEAVING

Yarn is to the weaver what clay is to the potter, metal to the blacksmith, and wood to the carver - the raw materials required for creating the finished products.

In the case of weaving, the character of the woven web or fabric depends to a large extent on the properties of the yarns from which it is made. According to Oguntona (1993), all yarns are composed of fibres, either of natural origin (i.e., obtained from animals, insect and plants) or

artificial origin (i.e., man made fibres, derived by extrusion of synthetic polymers through the spinnerette).

Until the twentieth century, most weaving, was confined to the four major natural fibres - cotton, linen, wool and silk - Held (1978). However, since the 1930s, Man-Made-Fibre (m.m.f.), have introduced a vast number of both regenerated and synthetic materials, many of which are suitable for hand-weaving.

Hand spinning and dyeing used to be important auxiliary crafts to weaving in Nigeria. Hand spun cotton yarn and factory made yarns were commonly dyed with natural dyes, such as indigo (for range of blue), Kola (for yellow), Camwood (for red), a dye from Mango back (for beige), vitex grandifolia (for black). Cotton yarn is most generally used for warp and weft. Silk and wool also featured as weaving yarns in some parts of Nigeria. Murray (1936), observes that as far back as the fifteenth to sixteenth centuries, cotton and wool materials have been used to curiously weave cloth in Benin Empire. This eventually died out, but traces of this technique could be found now in Ijebu and Akwete areas.

Gilfoy (1987), believes that West African wool weaving is limited to a rather small area surrounding the Northern bend of the Niger river, where there are enough water for

sheep to survive the harsh dry season, and where climatic condition required woolen materials. According to Lamb and Holmes (1980), another distinctive feature of Yoruba weaving is the use of natural Nigerian wild silk, known as `Sanyan' in Yoruba and `Tsamiya' in Hausa. This is obtained from the Anaphe infracta and Anaphe Moloneyi moth.

Infracta, the cocoons of which occur in clusters contained within a brown silk pod, is the preferred source of silk for Yoruba weaving. While Moloneyi, with whitish cocoon cluster, unprotected by an outer case, provides a thread much used by the Yorubas for embroidery, particularly in Ilorin area. It is also so used by the Nupe, the Hausa and the Kanuri in Borno. Both species are to be found, according to various scholars, in the Savannah of Northern Nigeria, particularly in the Tamarind tree, but also in Doka, Baure and Markarfo trees. Unlike the thread of the better known Bombyx Mori silk-worm (of the Mediterranean and the far East), Lamb and Holmes (1980), claim that Anaphe silk is too fragile to be drawn as a single fibre. In addition, the researcher opines that, being wild, the Anaphe moth bore a hole at one end of the cocoon for its exit, thereby breaking the continuity of the silk thread.

The spinning process of Anaphe silk yields a yarn which is thicker and tougher than that of the Bombyx silk, but

also a yarn of greater strength and resistance to rot. The yarn is usually woven undyed so that its natural brownish shades are characteristic of a cloth used for expensive and important gowns and robes, by the Yoruba people.

Today, for the bulk of the Nigerian weaving craft production, factory made yarns have virtually replaced the traditional hand spun types. Apart from machine spun cotton, craft weavers across the country have been much attracted to a variety of man made fibre (m.m.f), yarns, including rayon, acrylic, cotton-blends and the metallic lurex type. Okeke (1955), claims that the introduction of factory made yarns have contributed to the improvement of the quality of the indigenous textile products in a number of ways. He states that, the machine spun yarns, with the exception of the metallic lurex type, are now locally produced and cheaper than the imported ones. He considered this as a great relief to the craft weavers. He further contends that, the availability of these yarns in different shades and qualities help the handloom weavers to do away with some time consuming processes, thereby allowing for the production of a cheaper, more colourful and fashionable fabrics than was possible in the past.

In their search for new modes of expression, contemporary weavers, according to Held (1978), have begun

to show interest in less common fibres (such as Jute, Sisal, and Hemp); materials used by primitive people (such as feather, grasses, and rushes); and totally non-fibrous materials (such as Wire and Plastic). This new trend implies that the suitability of a material for weaving is limited only by its appropriateness to the purpose for which it is intended. It also shows that no matter how much skill and imagination the weaver contributes, the finished product will always reflect the quality of its raw materials.

2.6 SUMMARY

Chapter two presents the synthesis of available related literature within the context of the problem area. It covers the historical evidence of weaving craft and the evolution of the loom. It proceeds with an extensive discussion on types of looms and their structures, weaving process, and technique; and the various raw materials available for weaving.

The next chapter deals with research design and methodology. Kerlinger (1977), describes research design as the plan, structure and strategy of investigation conceived so as to obtain answers to research questions and to control variance.

CHAPTER - THREE

METHODOLOGY

3.1 INTRODUCTION

This study is meant to explore the possibilities of employing locally available materials and resources for the fabrication of an eight-shaft, two warp-beam, table loom. Also, experimental weaving and utilization of the resultant fabrics are part of the study.

The research design used is the product development or research and development (R and D) approach. This approach, sometimes referred to as Research-based development (Adetoro, 1997), consists of a cycle in which a conversion of a product is developed, field tested, and revised.

According to him, the step taken in this process is called Research and Development Cycle, and the approach is more commonly used in Environmental studies, Engineering, Education, Pharmacy, Medicine, Veterinary Medicine and General Sciences.

3.2 DATA COLLECTION INSTRUMENT

Data for this study were collected through the primary and secondary sources, using multiple instruments, as one may prove inadequate in obtaining the data or materials required - more so, that Research and Development

(R and D) is meant to design and validate products as well as translate the research findings to usable item. Pelto (1970), recommendeds the use of a variety of instruments to give greater credibility to a research result.

In order to establish a foundation for this study, the researcher relied upon related knowledge accumulated by scholars, thus, the consideration of the secondary source of data before the primary source. In his attempt to differentiate one source of data from the other; Adetoro (1997), contends that the secondary source includes any publication written by an author, who was not a direct observer or participant in the events being described. Consequently, the secondary source of data for this study includes; published studies and texts; and unpublished dissertations, theses, conference and seminar papers; covering the historical background of weaving-craft, evolution of the loom, types of looms and their structures, weaving technology, and raw materials for weaving.

From the information gathered through the secondary source, particularly those related to loom structure and raw materials for weaving, the researcher was able to identify materials and data required for the study which are collectable through the primary source. In corroborating the view of others, Adetoro (1997), states that the primary

source is a direct description of an occurrence by an individual who actually observed or witnessed the occurrence.

For this study, therefore, the primary source of data collection entails a field study approach in order to determine whether the resources and materials required for the project are adequately available locally; Oguntona (1997), explains field study as a discipline in research methodology, which entails the movement of the researcher to a new location relevant to the study, in order to gather data or material necessary for the research. He further opined that the researcher is at an advantage during field study to come face-to-face with the informants (i.e., those that possess first hand or original and authentic information concerning the problem area), and to observe without inhibition.

The instruments employed for data collection, through the primary source, were mainly oral inquiry or interview and observation. Ndagi (1984), states that; interview is used for collecting information in a face-to-face contact when a researcher wants to obtain a reliable and valid information in verbal responses from respondents in order to confirm or reject hypotheses or theoretical statement or state of affairs. Interview in the context of this study

was conducted in order to gather information, related to wood and wood-work, tools and equipments for wood-work and production of usable items, from the resource persons.

Along with interview, observation, i.e., participant observation, was employed. According to Ndagi (1984), observation is a direct means of studying the overt behaviour as it happens. In his own opinion, Afolabi (1996), explains observation as a process when a researcher subjects an object to close, usually visual, surveillance in order to obtain information (i.e., recorded data), which are related to hypotheses or theoretical statements. In addition, he opined that when the researcher engaged in the activity being observed, participant observation occurs. Whereas, Oguntona (1981), states that; participant observation is a technique developed by sociologist to study groups and their structures, and individuals within the context of the groups or an individual roles, based on observation and interview. This implies that observation, in whatever form, and interview goes hand-in-hand. Ethnographers, and other researchers alike, frequently encounter situation that hold little opportunity for participation; they must then depend on observation alone and ethnographic interviews (Spradley, 1979). Thus as an instrument for data collection, participant observation, as employed in this study, involves the researcher engaging in

the actual construction of an eight-shaft, two warp beam table loom, and practical weaving. However, there were instances, such as in the blacksmiths workshop, when the researcher was restricted to observation only, Ethnographers have used participant observation techniques in a variety of settings, from the simplest to the most complex communities, Oguntona (1981). He went further by citing McCurdy (1971), (a remote tribal village in India); Nelson (1969), (an Eskimo hunting group in Northern Alaska); Kruse (1975), (a self-service restaurant in Helsinki, Finland); and Nash (1975), a bus in Tulsa, Oklahoma, as settings where Ethnographers have utilized participant observation.

To supplement other instruments used, photographs were taken at various stages, both in the carpentry workshop and weaving studio using a 35mm Yashika Camera (see Plates 1 to 6). Oguntona (1981), in corroborating the view of Collier (1967), states that, photography offers considerable insight into the use of photograph as a means of triggering responses which might not be touched upon by verbal interviewing alone, and that it helps respondents with marginal language fluency to communicate, accurately, their feelings about complex circumstances.

A pilot study was also conducted by the researcher in order to provide a trial run basis for loom construction in



PLATE - 1: Working on the Loom Parts in the Carpentry Workshop in Lagos



Plate - 2: Putting Finishing-Touch on the Loom in a Carpentry Workshop in Samaru



PLATE - 3: Assembling the Loom After Finishing



PLATE - 4: Drawing-In (Drafting) Warp-Ends Through the Eye of the Heddles on the Loom



PLATE - 5: Drawing Warp-Ends throgh the Reed-Dents (Reeding)



PLATE - 6: Weaving in progress on the Loom

the carpentry workshop and experimental weaving in the studio. Since this investigation is practical in nature, pilot study approach was employed also to try out a number of alternative measures or techniques; provide clear cut-ideas, approaches and clues in resolving issues not earlier foreseen; and improve the chances of accomplishing academically acceptable findings in the main study. Pilot study according to Afolabi (1996), can be regarded as a small scale approach of the envisage study or investigation, whereby a prototype of the main study is developed. Consequently, this approach availed itself as a means to reduce, to a large extent, the number of treatment errors that would have occurred in the main investigation, as most of these errors would have been identified in the pilot study stage.

3.3 PROCEDURE FOR MATERIAL OR DATA COLLECTION

The fabrication of a modified table loom was chosen as the focus of this study for several reasons. It started in 1989 when the researcher was employed as an academic staff in the Textile Design Section of the Department of Industrial Design, Yaba College of Technology, Yaba, Lagos, Nigeria. The institution is one among various tertiary institutions in the country where imported contemporary manual looms are used in the teaching of weaving craft.

Various types of manual looms and their accessories were provided for this purpose. These looms include; the Danish loom, Elex loom, and upright rug loom (which are versions of the floor loom); the table loom; and the carpenter frame traditional vertical and horizontal looms.

In the process of imparting knowledge to students, year in, year out, through the practical demonstration of weaving on the various looms and their accessories, the researcher became more and more acquainted with the processes of weaving and the working mechanism of the loom.

The Textile Design Section of the Department of Industrial Design, Yaba College of Technology, Yaba, Lagos, Nigeria, is seen as a resource centre by teaming prospective weaving craft entrepreneurs, who always come for one expert advice or the other.

One of such entrepreneur, in 1991, sought he researchers guidance on the appropriate type of loom for her envisaged weaving craft centre. In the process of assisting this entrepreneur, the researcher was opportune to visit some weaving centres in Ilesha and Ado-Ekiti in order to investigate the various types of looms in use. During this study tour, and many others that followed, the researcher noticed that, unlike the floor loom, the table loom has not been adopted into the weaving craft industry in the country.

This observation, fully aroused the researcher's interest and desire for an indept knowledge of the loom and weaving mechanism. Ever since, the table loom and the prospect of its being fabricated locally and adopted to the weaving craft industry in the country has pre-occupied the researchers thought. However, several types of information, collectable from two main sources (the primary and secondary sources), are required to facilitate the process of satisfying the researcher's curiosity.

3.3.1 Secondary Source of Data

The researcher made use of library facilities within the Ahmadu Bello University, Zaria, Nigeria (which included the Kashim Ibrahim Library, and those in the Department of Fine Arts and Faculty of Education), as well as the library of Yaba College of Technology, Yaba, Lagos, in collecting relevant information.

Related texts, theses, journals, magazines, conference and seminar papers were consulted and synthesized to broaden the researchers' horizon in the area under investigation. Scholarly reports and contributions were appreciated and considered in order to provide the theoretical framework for this study.

3.3.2 Primary Source of Data

Guided by the information gathered through the secondary source, the researcher sought and received the consent of the Chairman of his Supervisory Committee before embarking on a field study, which was geared towards the collection of materials and information through the primary source. Experience has shown that before a researcher gets to the site of the study, a lot of behind-the-scene activities take place, Oguntona (1981). He further stated that, field work calls for good planning, adequate preparation and some foresight. To this end, since 1991 when the researcher first noticed that, unlike the floor looms, the table loom is yet to be adopted - to the weaving craft industry in Nigeria, effort had not been spared in seeking information from various sources in anticipation of this study.

In executing the field study, the researcher maximized the previously established contacts and association with resource persons, institutions, vocational centres and locations, relevant to the issue under investigation. Armed with the working (Technical) diagrams of the envisaged loom produced by him, the researcher moved from Zaria to Lagos State and its environ, where the field study was carried out. Lagos metropolis was chosen as the base for the field

study for the following reasons; its status as the commercial nerve centre of the Nation, which made it a possible location where the researcher can attend to a great number of variables and their inter-relations concurrently; it is the location of Yaba College of Technology, which could serve as a useful resource centre for the field study; its proximity to other various locations relevant to the situation under study; and also because, having conducted the pilot study there, the rapport developed with some resource persons, local market traders and trading companies then, might put the researcher in better working relationship and bargaining position. Apart from the markets and trading companies within Lagos metropolis, others located at Songo-Otta, Ijebu-Ode, Abeokuta (in Ogun State); Ibadan (Oyo State); Ilesha (Osun State); and Ado-Ekiti (Ekiti State); were visited to ascertain the availability and prices of some other materials required for the project.

On arrival in Lagos, the researcher followed his tentative plan of action, which was modified as events unfolded themselves in this order:

i. The home of the resource person, who is knowledgeable in both wood and metal works, was visited. The first visit was for socializing, and re-establishing the previous cordial relationship. It was necessary at

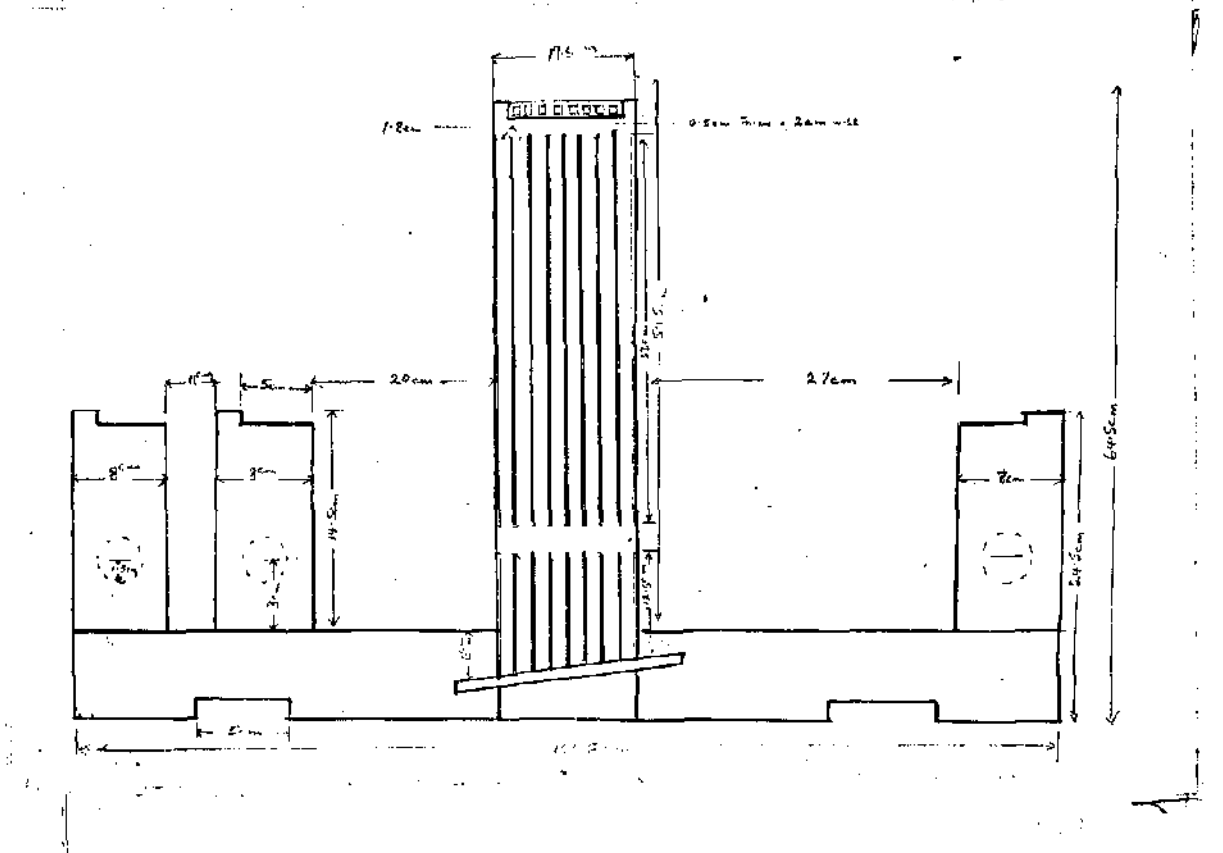


FIGURE - 3.1: Inner Side View/Dimension

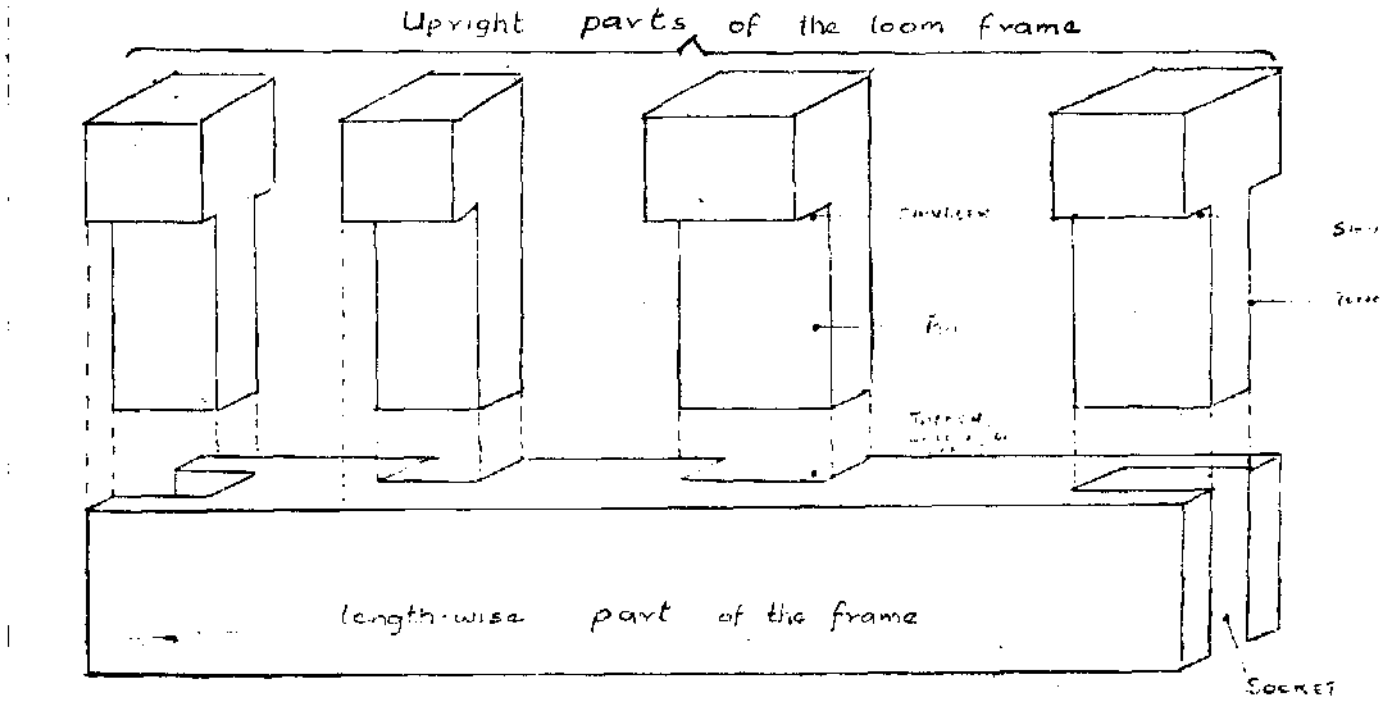


FIGURE - 3.2: The Joints (Open Mortise and Tenon; and Tee Halving), Used in Assembling the Length-Wise and Upright parts of the Loom Frame

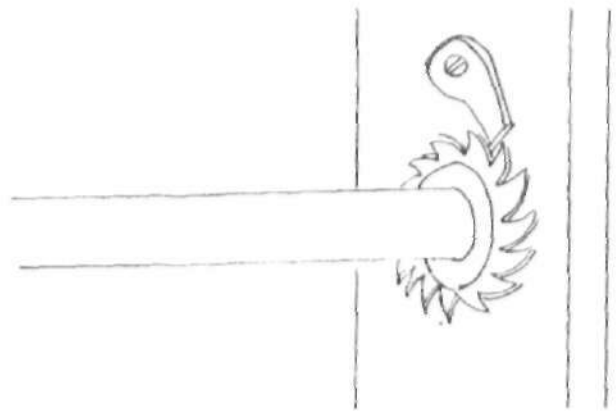


FIGURE - 3.3: Method of Fixing the Ratchet to the Rollers and the Rollers and Catch to the Loom Frame

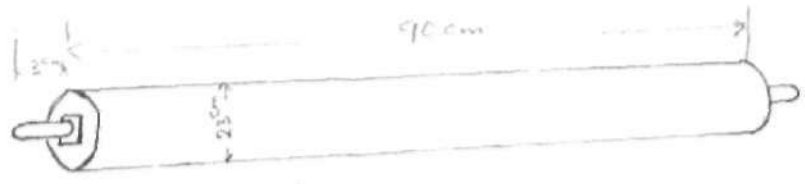


FIGURE - 3.4: The Shape and Dimension of the Rollers

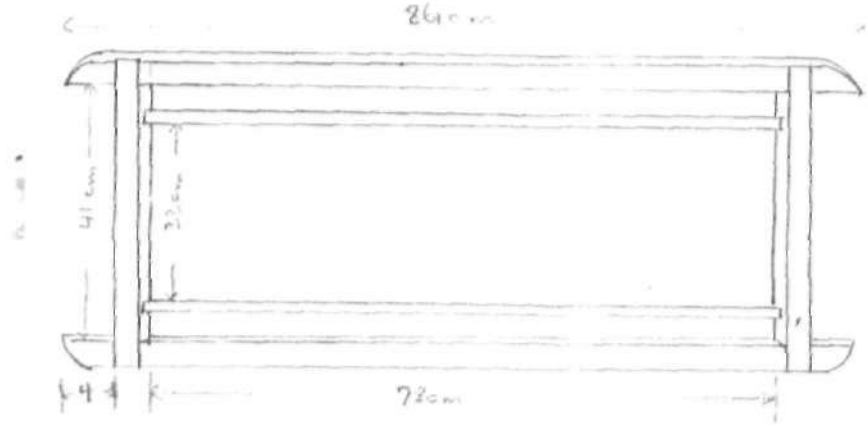
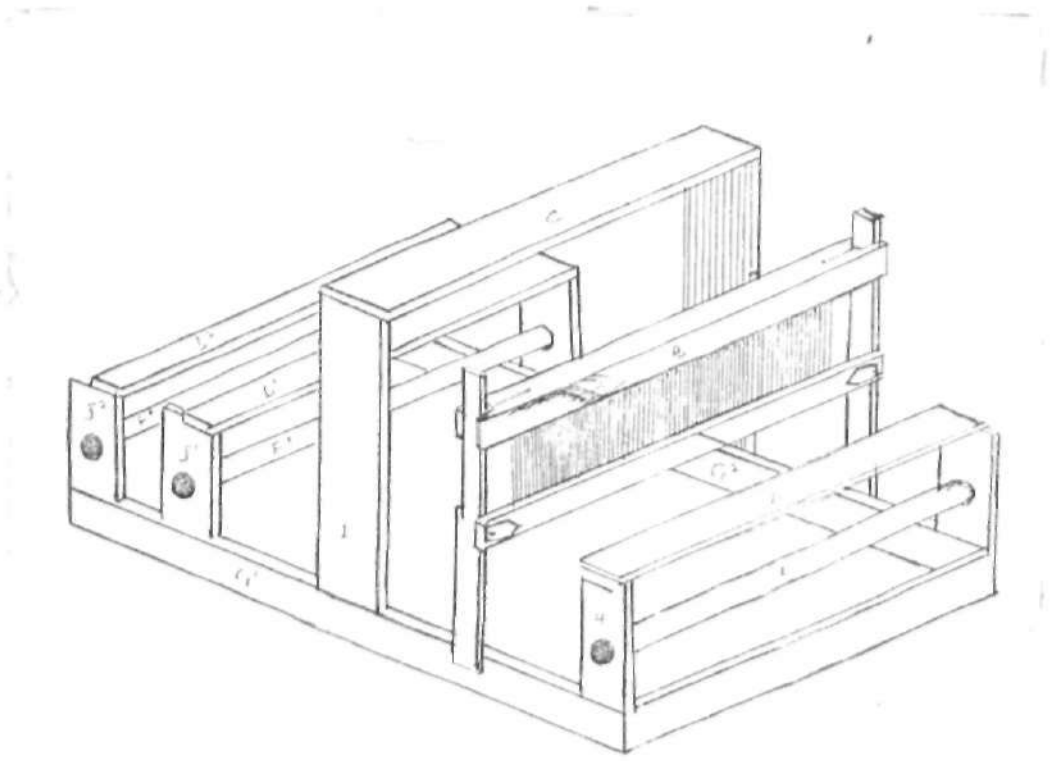


FIGURE - 3.5: The Shape and Dimension of the Shafts



LEGEND

A	-	Breast Beam
B	-	Beater
C	-	Castle
D^1 & D^2	-	Backrests
E	-	Cloth Roller
G^1 & G^2	-	Lengthwise Parts
H,I,J,& k	-	Upright Parts

FIGURE - 3.6: The Loom

because of the distance between the various locations and transportation problem. The materials were eventually procured from the following places: the Saw-mill at Itire (woods for loom frame); Texma, Nigeria Limited, Ikeja (Heddles); Owode Onirin Market (Metal and Steel for bracing and heddle rods); Ajani and Sons Foundry Limited, Sango-Otta, Ogun State (moulding of Ratchet wheels and catches); and Oje Market, Ibadan (metal Reed). Other materials were got from Oke-Arin, Mushin, Lawanson and Tejuosho Markets, all in Lagos.

It is pertinent to mention that the visit to the Blacksmith workshop (Foundry) at Sango-Otta took place on the fifth day of the material procurement exercise. While this visit afforded the researcher the opportunity to interact with the Blacksmith and observe him at work, it was not possible to cast the ratchet wheels and their catches that same day. This was as a result of the long process involved; non-availability, in the Blacksmith's workshop, at that particular point in time, of the material stipulated for the moulding job; and the previous commitments of the Blacksmith. The researcher was made to understand that the casting process involves the following stages:

i. Production of the models of the ratchet wheel and its catch to specification, using wood.

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ii. Production of the mould, which should take the negative aspect of the models, using Plaster of Paris (P.O.P).

iii Smelting the material (aluminium in this case), to be used, when procured, in moulding the ratchet wheel and catch.

iv. Pouring the molten aluminium into the mould to cast, one after the other, the required number of the ratchet wheels and catches.

v. Dressing the cast objects by fenting off the jagged edges.

In view of the on-going, the researcher had to re-visit the Blacksmith workshop, two weeks later, to collect the finished job.

Seventeen days after the arrival of the researcher in Lagos, and the procurement of the required materials, the fabrication of the loom was commenced in the resource persons carpentry workshop. Working at it on daily basis, the loom fabrication was completed in twenty days. The next forty-eight days were spent carrying out series of experimental weaving on the loom, and consulting other resource persons, who assisted in the development of certain products with the resultant woven fabric.

3.3.2.1 Materials Required for Loom Fabrication

1½ Pieces of 1" x 12" x 144" Hardwood (Mazonia)

3 Pieces of 3" x 3" x 144" Hardwood (Mazonia)

3 Ratchet wheels and catches (aluminum)

2 Wing nuts and bolts

2 Hexagonal nuts and bolts

36 Pieces of various sizes of screws

1 Piece of $^{1}/_{8}$" x 1" x 60" Metal sheet

2,000 Pieces of metal heddles

2 Yards of Grey baft fabric

250 Gram of Cascamite powdered resin glue

300 Gram of 1" Nails

6 Pieces of sand-paper (Grade-80)

1 Litre of Luco Wood Varnish

½ Litre of Glue

3.3.2.2 Tools and Equipment for Wood Work

Work beach (fitted with a vice)

Brace and wood drill bits

Claw and Warrington Hammers

Mallet and Punches

Rebate plane (of various sizes)

Chisels (of various sizes)

Saws (of various teeth finess)

Square rule, mortise gauge and steel rule

Flat screw-drivers (of various sizes)

Adjustable Wrench and 13mm Spanner

3.3.2.3 Materials for Experimental Weaving

3 Large size cones of cotton yarn (White)

4 Medium size cheese of cotton yarn (Yellow)

18 Small size cheese of viscose rayon yarn (Assorted Colours)

9 Small size cones of cotton/polyester yarn (Assorted Colours)

12 Hanks of cotton yarn (Black)

16 Hanks of Viscose rayon yarn (Assorted Colours)

6 Balls of acrylic yarn (Assorted Colours)

3.3.3 Pilot Study

Based on previous training and experience, as well as the preliminary investigations carried out on the subject, "weaving and the loom", the researcher is most acquainted with weaving technology, the structure and the working of the loom. Ideas based on the problem area, within the scope specified, were earlier investigated, employing the pilot study approach.

In executing the pilot study, competent resource persons were sought and consulted concerning, in particular, issues relating to wood and metal works, and the conversion of textile fabrics into certain end-uses. These materials,

and in some cases their close substitutes were procured and used in the construction of a prototype of the loom, as envisaged in the main study.

Having developed a preliminary form of the loom, it was evaluated in line with the terminal goal. This was accomplished through the various experimental weaving carried out on the loom, both in the carpentry workshop and weaving studio. Clues in resolving issues not anticipated prior to the pilot study, as well as execution errors, likely to occur in the main study, were isolated and addressed.

3.3.4 Workshop and Studio Experimentation

Technical drawings eventually emerged from the numerous attempts at producing working (Technical) diagrams (see Figures 3.1 to 3.6), on which the loom fabrication is to be based. One of the diagram shows the envisaged loom to advantage (Figure 3.6). It indicates each of the loom part. Some other ones contained the dimensional data of the side view of the loom frame and some other parts of the loom (Figures 3.1 and 3.3 to 3.5); while another of the diagrams illustrate the joints to be used in assembling the various parts of the loom (Figure 3.2). These diagrams guided the fabrication of the envisaged loom, which is an eight-shaft, two warp beam, table loom.

It is noteworthy to reflect on the fact that there is an infinite number and variety of patterns (designs) that may be woven on a basic four-shaft, single warp beam, table loom. However, the more intricate the weave (pattern), the greater the number of shafts required on a loom. In addition to pattern complexity, the number of shafts also affects the density of a potential woven fabric. For instance, if a very dense - that is, a very tightly woven - fabric is to be constructed from relatively fine yarns (such as those used by most craft weavers in Nigeria), a great many warp-ends, and therefore, a great many heddles, would be required. A two-shaft loom (such as the traditional horizontal loom), and the common basic four shaft looms, might not be able to conveniently accommodate the necessary number of heddles on their only two or four frames. Also the distribution of the warp-ends onto several shafts, lessens the weight that each lever will have to lift.

According to Brostoff (1987), some woven designs requires more shafts and some assorted warps patterns with different tension, fibre type, yarn count, etc., require two warp beams. This view adequately describes the nature of most fabrics woven by craft - weavers in Nigeria, who are expected to benefit from this study. It is to these ends that the choice of the eight-shafts, two-warp beams, table loom is based.

The data collected through the primary source, by inter-rogating the resource person, got the researcher acquainted with the technicalities of wood work and its tools and equipment. This enables the researcher to participate in the loom fabrication, which was executed in the carpentry workshop of the resource person, using the tools and equipment provided by him. The loom frame, w ich has a maximum width of 90 centimetre, length of 101.5 centimetre and height of 64.5 centimetre is more or less the overall structure of the loom. It consists of two length wise parts, to which the vertical parts of the frame were fixed. In addition, it provides the necessary support for other parts of the loom. These include; the two warp rollers (beams), two back-rests, a breast beam, a cloth roller, eight shafts (which consist of frames and heddles), and a beater(which consists of frame and reed).

After the needed materials have been procured, those woods for the warp and cloth rollers (beams), back-rests, breast beam and wooden pulleys, which needed special shaping, were giving to a turner to work on. The woods for the other parts of the loom frame were planed to the required thickness, width and length by the researcher, together with the resource person. Joints, essential and appropriate for the assembling and fastening together of the various parts of the loom frame were also made in the

carpentry workshop. In order to facilitate an easy dismantlement and re-assembling, screws, and nuts and bolts were used in fastening together the various parts of the loom - with the exception of shaft-grooves, front and back uprights, which were fixed permanently with glue and/or nails.

The researcher also conducted series of studio weaving experiments, guided by information gathered through the various sources. This involved paper designs production, warping, looming and numerous weaving, using assorted coloured yarns, all in experimentation of the fabricated loom. Furthermore, resource persons were engaged in the conversion of the resultant fabrics into innovative products.

3.4 SUMMARY

This chapter deals with the entire research design for the study. It described the instruments and procedures for materials and data collection. The results of the study are presented in the next chapter.

CHAPTER - FOUR

RESEARCH FINDINGS

4.1 INTRODUCTION

The principal objective of this study is to fabricate an improved, relatively inexpensive table loom, which will be adaptable to the weaving craft industry in Nigeria, using locally available resources and materials. Thus, in considering the design for the loom, emphasis has been placed on the following parameters: availability and adequacy of local raw materials; characteristics of the loom; cost; and the over-all performance of the loom. The aforementioned parameters were taken into consideration from the conceptual stage on the drawing board, to the sourcing of relevant materials, as well as the construction process.

Invariably, the materials and data collected through the various sources were organised around the set of research questions raised in chapter one, to which the result of this study provides answers. Consequently, the result of this study is presented and discussed in this chapter in three parts as follows: Loom Construction; Experimental Weaving on the Fabricated Loom; and Utilisation of the Resultant Woven Fabrics.

4.2 LOOM CONSTRUCTION

The various related literature reviewed have revealed that there are some important features to be taken into consideration when constructing a manual loom - particularly, a table loom. Most authorities have it that to be functional and effective, a good loom must be strong, accurately and squarely aligned. It should have a well-balanced beater that swings easily and evenly; also the beater must be parallel to the breast beam so that the "fell" line is beaten-in parallel to the previous picks.

It has been further revealed that there should be a reasonable distance between the back rest and the reed. The beater, breast beam, back rest and shafts, should be easily removable, if need be, to facilitate easy looming process. The shafts must sit evenly so that a clear shed is formed; with its lower part almost resting on the shuttle race. Also, the alignment of the shafts should be in such a way that the heddle-eyes are at equal level, and placed fractionally below the shuttle race.

As regards the warp and cloth rollers, record shows that they must have a smooth surface, and should be well aligned in relation to one another. While they must be held rigidly until they are released, the warp and cloth rollers should rotate freely in their various supports for an easy

and effective warp-let-off and cloth-take-up, respectively. The appearance of a good loom should be, aesthetically pleasing without sacrificing its main function - i.e., the interlacing of the two constituent yarns (warp and weft), of a woven fabric.

Guided by these information, which eventually constituted the yard - stick for comparison, an eight-shaft, two-warp beam table loom was fabricated. This loom, which shall be referred to henceforth as `the loom', is made up of three main parts. These are: The Frame, which include; the warp and cloth rollers (beam), back rests and breast-beam, and castle; the shedding mechanism, and the beating mechanism.

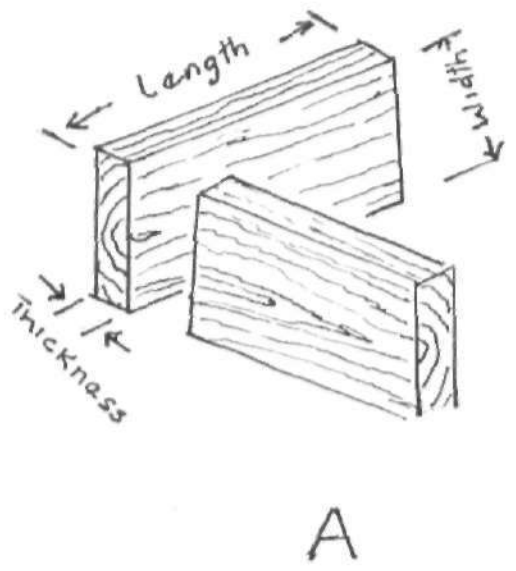
4.2.1 The Frame

Of the numerous varieties of close grained hardwood with a smooth surface locally available, the loom frame was constructed from Mazonia wood. This provided the desired result - a good loom.

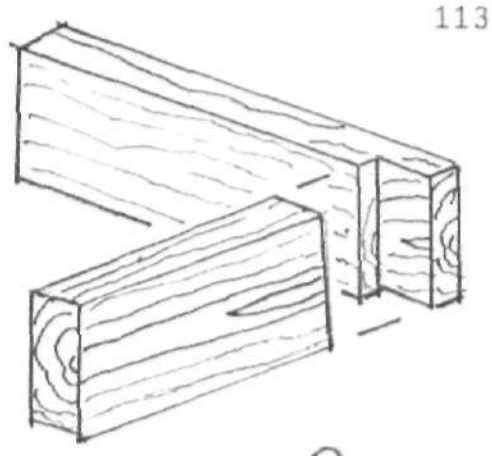
The over-all frame (see Figure 3.6), consists of a pair of length-wise and four pairs of up-right parts. Two pairs of the up-rights (warp rollers supports), appropriately distanced, are fastened, to the back-end of the length-wise parts, two-a-piece. A pair of the up-rights (that which contains the shaft-grooves), are fastened, one-a-piece,

close to the centre of the length-wise parts. The remaining pair of up-rights (cloth roller supports), are fastened, one-a-piece, to the front-end of the length-wise parts. The pin-head ends of the warp and cloth rollers fit into holes drilled on the up-rights that support them. These holes are appropriately located so as to adequately position the rollers for the necessary alignment.

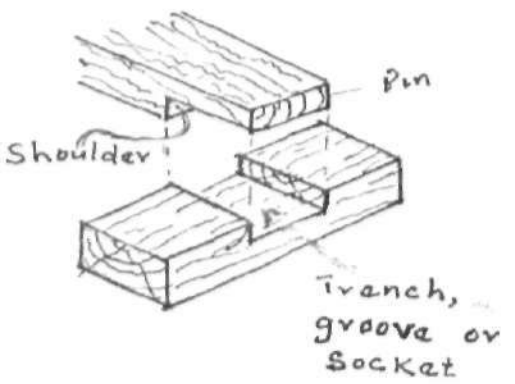
Simple joints are essential in assembling and fastening two or more pieces of wood together. Thus, the aforementioned parts of the loom frame are assembled using wood joints (see Figures 4.1a-d), which provide the required strength and durability. In fastening these parts together, screws, nuts and bolts are used. These allow for easy dismantlement and re-assembling, thereby resulting in a loom that can be conveniently packed for transportation. As revealed by Bamiro, et al (1988), joints used in construction work are classified into three main groups of: Widing joint (used in joining edge to edge to provide wider boards); Angle or Box Joints (employed to fix together pieces with faces to form right angle); and Framing Joints (used for frame construction with parts joined end to edge). The last two of these Joints were found to be appropriate for the construction of the loom frame.



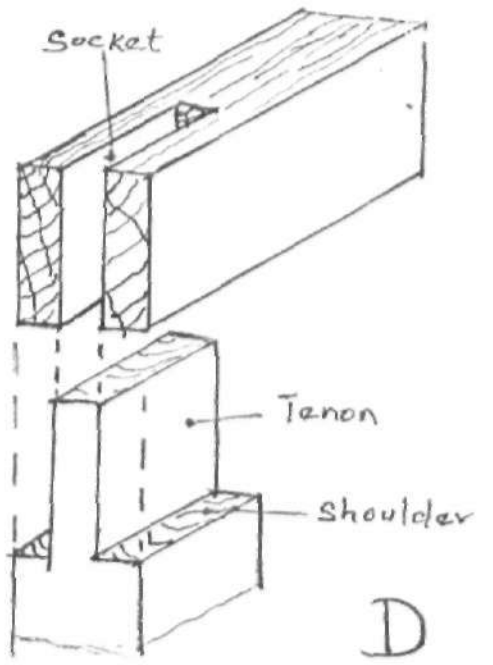
A



B



C



D

FIGURE - 4.1(a): Plain Butt Joint

(b): Half Lap Joint

(c): Tee Halving Joint

(d): Corner Bridle Joint

The Corner Bridle Joint, often referred to as the Open Mortise and Tenon Joint (see Figure 4.1d), is found to be adequate in joining those up-rights that support the outer warp roller and the cloth roller to the length-wise part of the loom frame. While the up-rights, which support the inner warp roller and the up-rights, bearing the shaft-grooves, are joined to the length-wise part of the loom frame, employing the plain Tee-Halving Joint (see Figure 4.1c). In order to achieve the required result, the construction processes of these joints involve the following:

(a) Corner Bridle Joint

i. Preparation of the length-wise and up-rights pieces to be assembled to required length, width and thickness, using the rebate plane.

ii. Setting of the Mortise gauge $^{1}/_{3}$ to $\frac{1}{2}$ the thickness of the wood and gauging round end of socket and tenon. The ends of the length-wise part of the frame bear the socket, while the bottom ends of the up-rights bear the tenon. All pieces (parts), were gauged from the face side, wth the waste wood clearly marked.

iii. Working in the waste part of each piece, the grain was sawed down, using a fine toothed saw.

The shoulder of tenon was cut with a fine saw, being careful not to cut into the neck, which may lead to a weakened joint. The waste-wood in the socket was chopped also with a fine saw, and the shoulder trimed with a level edged chisel.

iv. Having trimed off the waste, the parts were assembled to flush, and at right angle (the Tee-Square was used to ensure this). Thereafter, the assembled pieces were fastened together, using Cascamite powdered resinglue, and then re-inforced with metal dowel (bracing).

(b) Tee-Halving Joint

i. The position of groove was marked with pencil on the face side of the length-wise part of the loom frame, which already has been prepared to required length, thickness and width, and also tested for squareness. The `pin' part of the joint was constructed on the bottom ends of the up-right pieces. The length of `pin' was measured out (making allowance for little waste), on the reversed side of each of these pieces.

ii. The gauge was set to half the thickress of the length-wise part, at the appropriate position, and the depth of the groove marked on both edges.

Like-wise, the thickness of `pin', along the edges and across the end of the up-right pieces was gauged and marked. Waste in all cases was marked with crosses.

iii. The sides of grooves were squared with marking knife and sawed down the gauge-lines. The bulk of waste was chiseled out to the required depth to create the groove, and the waste on the pieces bearing the `pin' was ripped off and the shoulder-line squared.

iv. The pieces were then assembled. The up-right, supporting the inner warp roller, were fixed permanently to the length-wise pieces, using Cascamite powdered resin glue. While the up-right that accommodate the shaft-grooves were fastened to the length-wise, employing screws. Dowels, made of metal, were also used to reinforce these assemblage.

4.2.1.1 Warp and Cloth Rollers (Beam)

The effective width of each roller on the fabricated loom is 78 Centimetre with a circumference of 23 Centimetre. The pin-headed ends of each roller are 6 Centimetre long with a circumference of 8.5 Centimetre. The dimension of the pin-heads made the rollers to fit not too

loosely into the 9 Centimetre holes, drilled on the up-right parts of the loom frame that supports them, thereby allowing the roller to rotate freely.

According to Brostoff (1978), much depends upon the construction of the warp and cloth rollers. It is very difficult to weave with rollers that are distorted or out of line - she opined. In view of this, and bearing in mind that the warp exerts tremendous tension, the researcher ensures that the warp and cloth rollers are constructed in such a way that any desired tension can be achieved; the warp and cloth will roll off smoothly, evenly, and equally all across the respective rollers; and that the rollers are held rigidly until they are released. To accomplish the above, a ratchet wheel is fixed to the left hand end of each roller, and a catch to each up-right that supports this end of the roller, as shown in Figure 3.3. The latter is fixed in such a way that it could be set on and off the path of the former. When a catch is set on the path of a ratchet, it prevents the roller from rotating. Whereas if the reverse is the case, the roller will be able to rotate thereby permitting the warp let-off and clothtake-up motions to be effected.

The warp and cloth rollers (as shown in Figure 3.4), are identical in all respects, except that while two

warp rollers are provided on the fabricated loom, only one cloth roller is provided. The two warp rollers are located at the back of the loom, while the cloth roller is situated at the front. Warp is wound onto the warp rollers, while woven fabric is wound onto the cloth roller. The ratchet wheel and catch assemblage on each of the warp rollers, which act as a warp let-off motion, and the one on cloth roller, which represents the cloth take-up motion of the loom, works in conjunction with each other to maintain the required warp tension during weaving.

Each of the roller is covered with a grey-baft apron measuring ½ metre long by 78 Centimetre wide. One end of the apron is fixed permanently to the roller with glue, while the free end of the apron is hemmed in such a way that a 2 Centimetre wide, flat wooden bar can be inserted into it. It is to this end of the apron that the warp is attached - one end to the warp roller and the other to the cloth roller.

4.2.1.2 Back-Rests and Breast Beam

The back rests, which are two on the fabricated loom (Figure 3.6), are rigid cross-bars located at the back of the loom. Each of the back-rest supports the warp sheet as it unwinds from each warp roller. It also maintains the

iii. The parts are thereafter assembled and fastened together, using two screwing faces at each ends. It is note worthy to point out that the warp and cloth rollers had to be fixed in place before the back-rests and breast beam are fastened to their respective up-rights. Otherwise it would be impossible to fix the rollers after the back rests and breast beam have been fastened.

4.2.1.3 The Castle

This is the upper most part of the loom (Figure 3.6), which supports the shafts. While it is planed to a thickness of 2 Centimetre, its length corresponds to that of the loom width, and its width equals that of the up-rights, to which it is fastened. The Castle is assembled and fastened to the two up-rights that contain the shaft-grooves, thereby forming the shaft-house.

The Plain Butt Joint (Figure 4.1a), is used in assembling these parts of the loom frame. This joint involves the fitting of the square-ends of the up-rights against the flat, inner face of the Castle. Thereafter two screwing faces, at each ends, are used to fasten them together. The Plain Butt Joint, according to Bamiro, et al (1988), is comparatively weak because the end grain of a timber is the weakest part of wood for joining. However, it

proved adequate for the assembling and fastening of these parts of the loom frame, where strength of joint is not too important.

Half-way along the length of the Castle, two wooden brackets are fixed to each side of its edges, using Angle Lap Joint (Figure 4.1b); and fastened with two screwing faces each. These brackets support a steel-rod on which eight wooden pulleys are slotted.

4.2.2 The shedding Mechanism

The shedding mechanism of the fabricated loom incorporates all the parts necessary to create a shed, i.e., the tunnel like path created, by separating the warp sheet into two layers, through which the weft is traversed. These parts, in the main, include; heddles, shafts, pulleys, and levers.

4.2.2.1 The Heddles

A heddle, also known as heald, is a looped cord, shaped wire, or flat steel strip, with an eye (hole) in the centre, through which a warp yarn is threaded so that its movement may be controlled during weaving.

There are two main types of heddle: Cord and Metal strip heddles (Figures 4.2a and c). The latter is made of either a flat steel strip or a twisted wire strip. The

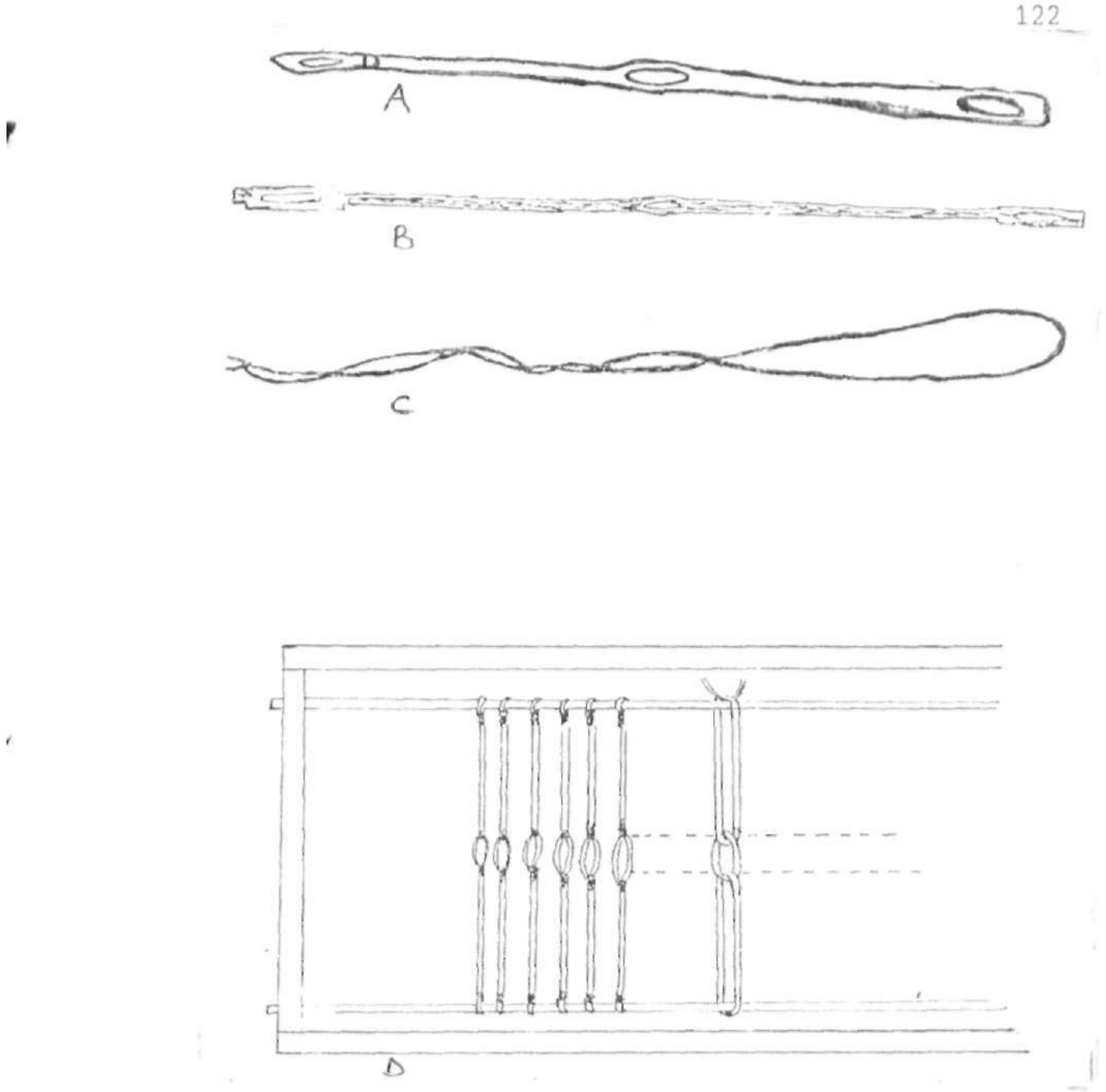


FIGURE - 4.2(a): Metal Heddle

length or size of the eye of the metal strip heddles, as shown in Figure 4.2a, vary from 6.25mm to 12.5mm. The Cord heddle, which could be made by the weaver, using an improvised tool, can have an eye as large as the weaver may desire (Figure 4.2c). Although, the Cord heddle comes out relatively inexpensive, it has a comparatively short life span; and cannot be used, dismantled, and reassembled for use in the production of another quality fabric. Also, it is most difficult to produce Cord heddles, whose eyes will be on equal level (Figure 4.2d), when mounted on the heddle bars. For these major and serious defects of the Cord heddle, and for the non-availability of the twisted strip-wire type locally, the flat steel-strip heddles, which are readilly available locally, are used. Though these heddles are expensive, however, they have a much longer life span; and can be re-assembled on the shafts to suit any weaving requirements. Unlike the Cord heddle, the flat steel strip heddle can move freely on the heddle bars. Thus, the possibility of them exerting undue tension and unnecessary strain on the warp yarns is remote. In view of these desirable factors, the loom has a more enhanced chance of producing a better quality fabric.

The flat steel-strip heddles used on the loom have a crimp or bend at one end, which aids the identification of

the top of the heddles. On mounting the heddles on the bars, the crimped-ends are on the top bar as suggested by Brostoff (1978). This enable all the heddles to face the same direction and their eyes to be maintained at the same level - thereby providing a clear shed. Furthermore, the heddles have a slight clock-wise twist at their eyes as they hang on the bars. This twist keeps the drawing-in consistent, as all the heddles rotate in the same direction. This act takes the rigour out of the drawing-in process; as well as quickening it. Consequently, the drawing-in operation on the loom is made easy and less time consuming.

4.2.2.2 The Shafts

A shaft, otherwise known as the harness or heddle frame, supports the heddles. The loom is provided with eight shafts. The number of shafts on a loom controls the complexity of weaves (design) it can produce - Held (1978). Invariably the loom has a wider designing scope than any of the traditional looms (single-shaft vertical loom and double-shaft horizontal loom); and the four-shaft contemporary floor and table looms, found among weavers in the Weaving Craft Industry and Tertiary Institutions and Vocational Centres in the Country.

Each shaft on the loom consists of two vertical and two horizontal parts, assembled to form a rectangular

while those on the other does not. The top and bottom heddle bars (flat steel strips on which the heddles are strung), are supported and kept in their appropriate position by these slots. The slots that goes through one of the vertical part of the shafts make it possible, whenever the need arises, for excess heddles to be removed from, or additional ones fixed onto the shafts.

To achieve this, steel wire contraptions are employed. Two of these contraptions are fixed close to the top and bottom ends of each vertical part of the shafts, on which the slots goes through. The curved end of each contraption is made to hook into a hole bored on the heddle bar. In order to remove or add heddles on a shaft, all that need be done is to unhook the steel contraptions at both ends and slide the heddle bars through the slots. By so doing, the other end of the heddle bars is dislodged from its slot, thereby allowing for the removal or addition of heddles. Thereafter, the dislodged ends of the heddle bars are fixed back into their slots and the steel contraptions, at the other end, hooked back in place to prevent the heddle bars from moving.

Each shaft on the loom is 86 Centimetre wide and 41 Centimetre deep. However, the effective width of each shaft, which determines the maximum warp width that can be

the loom are supported and worked through these sets of pulleys.

In order to work the shafts, a cord, which serves as a lever, has one of its end tied to the centre of the top slat of each shaft. This cord is passed over a pulley on the Castle, and then over an adjacent pulley situated on the aforementioned up-right part of the loom frame. The free-end of the cord is threaded through appropriate hole on a strip of wood screwed to the outer surface of the right-hand-side, up-right part of the loom frame. Some distance below this strip of wood, which has eight holes on it, is another strip of wood with a slotted edge, which provides a means for hooking or hanging the knob tied to the free end of the lever cord. While the former separates the lever cords, and keep them in order, the latter keeps the shafts in their lifted position. The distance between the two strips of wood corresponds to the depth (openness or clearness), of the shed created when the shafts are lifted.

4.2.3 The Beating Mechanism

The beating mechanism involves the beater, also referred to as Batton or Sley (see Figure 3.6), which maintains the parallel order of the warp sheet; controls its density (sett); and packs the weft yarns into position

(i.e., the cloth fell). It has two parts: the reed and reed-frame.

4.2.3.1 The Reed

This is a comb-like device, fixed on the loom, parallel to the shafts, through which the warp yarns are threaded after passing through the heddles. It ensures the perfect alignment of the warp yarns, as well as keeping them adequately spaced. The reed consists of several, evenly spaced flat metal-strips, strung between two slats or baulks. The spaces in the reed are called dents, which vary in size from 4 dents per inch to 40 dents per inch or more (2 dents per centimetre to 16 dents or more).

The number of dents, in every inch or centimetre across the width of the reed, denotes its size. Thus, a 20 dent reed has twenty dents per inch or sixteen dents per centimetre. For as long as the length of the reed is not greater than the maximum width of the reed-frame provided, there is no limitation to the size of the reed that can be used on the loom.

4.2.3.2 The Reed Frame

This is a rectangular frame work, which holds the reed. It consists of the following: a pair of vertical (right and left), and horizontal (top and bottom), parts.

The vertical parts, herein referred to as the sley arms, extend downward from the shuttle-race or race-board to a fulcrum at each side of the loom - thereby, allowing the beater to swing freely. The bottom horizontal part, henceforth referred to as the shuttle-race or race-board (a shelf along which the shuttle glides), is sturdier than the top part. The shuttle-race slants at an angle, which makes it to tilt below the breast beam whenever the beater is pulled forward to effect the beating-up motion. The groove created on the inner-plane or face of each of the horizontal part is wide and deep enough to accommodate the bulk of the reed. These parts are well smoothened, as is the case with other parts of the loom that came in contact with the warp and weft yarns.

The various parts of the reed frame are assembled, using the Corner Halving or Edge Lap Joint (see Figure 4.1b); and the open Mortise and Tenon Joint. The former is used in joining the shuttle-race to the sley-arms, at positions 15.5 Centimetre away from the top-ends of the latter. The plane of the sley-arms fits into the L-groove created on each end of the shuttle-race in such a way that the assembled parts flush and meet at Right Angles. The required firmness of the reed - frame is achieved, using three screwing faces to fasten these parts together.

The Open Mortise and Tenon Joint (see Figure 4.1a), used in fixing the top horizontal part of the reed frame to the sley arms; and the wing nuts and bolts used in fastening them together, provide the resultant easy dismantling and reassembling of these parts. The sley arms bear the tenon, while the socket of the joint is created on each end of the top horizontal part. The slit, which starts from the shoulder of each socket and terminates at the point where each wing-nut and bolt are located, facilitates the closure and opening of the socket round the tenon. Whenever the reed has to be removed from the frame work, each wing-nut and bolt at both ends of the top horizontal part, are loosened to open the socket, thereby freeing its grip around the tenon. By so doing, the horizontal part can be easily dismantled from the frame work. This arrangement made it possible for various sizes of reed to be used on the loom.

The oscillation of the beater, effortlessly, is achieved by the use of hexagonal nuts and bolts in fastening each of the bottom end of the sley arm to the sides of the loom. This is done in such a way that the beater is appropriately placed on the loom, parallel to the breast beam, thus, allowing the fell line to be beating-in parallel to the previous picks.

4.2.4 Loom Accessories

Some accessories, constructed for use on the loom include the following: shuttles, apron bars, lease rods and raddle. Without some of these accessories, beaming or looming process (i.e., the mounting of warp on the loom, ready for weaving), will be most difficult to accomplish.

4.2.4.1 Shuttles

There are many types and sizes of shuttles, each designed to carry the weft yarn for a particular kind of Web (Woven Fabric). However, four simple flat shuttles, made from thin smooth wood-strips are most appropriate - eventhough they do not release the yarns wound on them automatically. These shuttles are of two sizes - long and short. The long shuttles serve better when weaving a wide fabric; while the short ones proved convenient when weaving narrow fabrics.

4.2.4.2 Apron Bars

Three pairs of apron bars provided for used on the loom made it possible for warp to be attached to the warp and cloth rollers during the beaming or looming process. These bars are made from thin, smooth, wood-strips, the width of the rollers. Three of these bars are slipped, one each, through the hem-line of the aprons.

In mounting the warp on the loom, an apron bar (one each, in case of two warp sheets), is slipped through the loop formed by the warp close to the cross (Lease). These bars, along with the one slipped through the hem-line of the warp-roller apron, are referred to as back apron bars. After drawing-in (i.e., threading through the heddles), and sleying (i.e., threading through the reed), the warp - ends are tied in small bundle or grouping, to another bar, this one, as well as that slipped through the hem-line of the cloth - roller apron, are known as the front apron bars.

4.2.4.3 Lease Rods

They are usually in pair, and are similar to the apron bars. However, unlike the latter, the former have holes at both ends. They are used in maintaining the lease, while the warp is being beamed; and may be removed when the sleying is completed.

After the warp has been taken to the loom, lease rods are inserted into the warp on either side of the cross. One rod goes to the back, where the warp-ends cross, and the other rod goes in front. Thereafter, the rods are tied together, allowing about 2.5 Centimetre space between them.

4.2.4.4 Raddle

4.2.4.4 Raddle

This is otherwise known as spreader or warp comb. It may be used in spreading the warp evenly to the width to be woven.

An improvised version of the raddle has been provided for use on the loom. It consists of a smooth wood strip, measuring 90 Centimetre long by 5 Centimetre wide and 2.5 Centimetre thick. A series of 2.5 Centimetre (1 inch) finishing nails are driven into the broader surface of the wood at 2.5 Centimetre (1 inch) intervals.

4.2.5 Availability of Local Materials

Instead of the availability of the required materials locally, it was their choice that posed a problem. This is because there are numerous varieties of these materials locally, with related qualities, that satisfy the pre-requisite for the loom construction - particularly in the case of wood, which constitutes a greater percentage of the loom. Invariably, the choice of each material eventually used is based, among other factors, on its cost and abundance.

Components of the loom, made from these materials, which were sourced hundred percent locally, have demonstrated that they can perform and generate out-put,

which can rival any of their kind, imported from any part of the world.

4.2.6 Overall Performance of the Loom

The construction of the loom posed no problem, as there are adequate tools and equipments; as well as other related essential services required. The ultimate size of the loom is designated not by its overall dimensions, but by the maximum width of fabric that can be produced on it. Thus, the 78 Centimetre loom, with a frame work measuring 90 Centimetre wide by 101.5 Centimetre long and 64.5 Centimetre high, is comparatively a medium size loom.

Unlike the basic loom, the fabricated loom consists of eight shafts and two warp rollers, which to a greater extent, made it a much more versatile loom. Simple and complex weaves (designs), using variety of yarn types, can be produced on it. The various wood joints used in assembling its parts, resulted in a loom that is structurally firm and rigid (i.e., capable of withstanding agitation associated with weaving). Furthermore, as a result of the ease with which it can be dismantled and reassembled, the loom can be conveniently packaged for transportation.

The accuracy of the loom has been evaluated by comparing its structural proficiency and performance with

other manual looms. Data collected through the primary and secondary sources were sufficient for the comparison. The loom, in all its ramification compares favourably with the traditional and contemporary loom found among Craft Weavers, Tertiary Institutions and Vocational Centres in Nigeria.

Given the versatility of its design capability, the products of the loom are certainly aesthetically better than, and compares favourably (quality-wise) with those of other manual looms. It is evident, from the series of experimental weaving carried out on the loom, that it performed well for a good range of hand-woven fabrics.

4.2.7 Cost of the Loom

As stated by Held (1978), one basic rule that governs the selection of materials is to buy the best-quality materials that are affordable. However, in complying with this, the researcher did not loose sight of the fact that no matter how much skill and imagination one has, the finished product will always reflect the quality of its raw material. Although, a relatively inexpensive loom was envisaged, it became virtually impossible to compromise quality for economic gains. This is because a well constructed and durable loom, that will give effective service for a very long time is much more desired. Invariably, the loom will

rarely require persistent repairs unless it is badly handled.

The overall estimate of the cost of the loom could not be realised until a thorough market sampling had been carried out. Even then, the fluctuating market prices will not give room to be specific. While the future cost may be subject to variation, the cost at which the loom was fabricated, made it comparatively inexpensive.

Below is a rough estimate of the cost of the loom:

Loom Frame	N5,250:00
Reed	5,000:00
Heedles (2,000 @ N2.50 each)	5,000:00
Ratchets and Catches	1,800:00
Heedle Bars	3,840:00
Screws, Nails, Nuts and Bolts	640:00
Metal Bracing	1,250:00
Evostic and Cascamit Glue	220:00
Grey Baft	280:00
Transport and Miscillaneous	4,260:00
Honourarium	7,500:00
	35,040:00

4.3 EXPERIMENTAL WEAVING

Most authorities have it that before weaving can be carried out on any loom, several decisions must be taken and

a number of preliminary steps carried out. For each of the experimental weaving executed on the loom, using conventional, factory made yarns, series of decisions are involved, which boardered around the following: purpose and nature of the resultant woven fabrics; fibre content, colour, texture and count of the yarns; form or pattern of the weaving; the mechanics of the loom set-up; and the final construction of the woven fabric.

Each decision serves to limit the range of choices for those that follow. For instance, the purpose of the woven fabric determines the type or nature of fabric to be woven, which, to some extent, influences the selection or choice of yarn; the characteristics of the yarn limit the form of the weaving, or the other way round; the yarn and the pattern prescribe the loom set-up; and all of the foregoing influence the appearance (aesthetic) and quality of the web. In achieving acceptable results for each experimental weaving, the researcher has to put in place a systematic programme of thinking and planning (based on the aforementioned parameters), which involve more time than the actual weaving of the web.

4.3.1 Choice of Yarns for Warp and Weft

Having decided on the purpose of each fabric evolving from the series of experimental weaving, the next step is

Although, just about any yarn can serve as weft, not all yarns proved adequate for the warp. This is because the warp-ends have to be under tension, and be able to take much strain and wear as the weft is woven into it.

Even though, the warp-ends have to be strong, to withstand the weaving process, they do not necessarily have to be made of heavy or coarse yarns. Also, yarns that are very hairy are avoided for warp. This is becaue the loose fibres, sticking out of their peripheral - surface, will cause the warp - sheet to mat together; thereby not separating readily to effect a clear-shed, necessary for the production of a quality fabric. this apart, it will also slow down the weaving process.

As for the weft yarns, it is their superior dye ability (in the case of self-dyed yarns), and filling quality that informed their choice. Yarns used for weft are not necessarily strong, rigid or firmly twisted. They are practically any size (count) either single or ply and have any degree of twist. In some instances, same yarn count is used for both warp and weft. While warp-yarns in such instances, are 2-ply and unsized (because they are cotton/polyester blend), the weft yarns are 4-ply and sized (because they are hundred percent cotton, and the characteristic "hand" of Aso-Oke is desired in the woven

characteristic "hand" of Aso-Oke is desired in the woven fabric).

4.3.2 Decision on the Length and Width of the Warp

Prior determination of the maximum dimension of the resultant woven fabrics, which is influenced by the size of each intended end-use, is paramount. Decision on the length and width of each warp, to a greater extent, depends on this parameter. Several factors, which contribute to making the loom-state fabric smaller in both length and width, include the following: loom waste; warp take up; shrinkage and draw-in. Taking these factors into account resulted in economic use of materials (Yarns), as well as the competitive pricing of the woven fabrics. It also made it possible for woven fabrics, that are dimensionally sufficient for the intended end-uses, to be produced.

(a) Loom Waste

Any woven fabric will require additional warp length for tying onto the warp and cloth rollers; as well as for extending through the reed and heddles, on completion of weaving. This extra length is called loom waste or loom allowance. According to Held (1978), the portion in and behind the shafts, that cannot be woven off, is often referred to as the thrums; while Znamierowski (1973), reveals that the normal allowance for loom waste on floor loom and table

loom is about 1.5 metre and 0.5 metre (150 Centimetre and 50 Centimetre) respectively. However, when determined, the loom waste on `the loom' is 32 Centimetre. In determining this, a piece of string is tied to the warp-roller apron (which is at full stretch), drawn through the heddle and the reed, and then tied to the cloth roller apron (which is also at full stretch). Thereafter, the string is taken off the loom and measured.

Loom waste factor (i.e., the percentage of loom waste in relation to the shortest woven length possible on the loom), is lower than that of a basic floor and table looms. The waste factor makes it impracticable and uneconomical to plan a relatively short woven length on the loom. If, for instance, a metre (100 Centimetre) long fabric is to be woven on the loom, the percentage of the waste allowance will be on the higher side (i.e., $^{32}/_{100}$ x $^{100}/_{1}$ = 32 Per cent). Whereas, if same allowance is added to a 5 metre (500 Centimetre) woven length, the rate of waste will significantly drop (i.e., $^{32}/_{500}$ x $^{100}/_{1}$ = 6.4 Per cent).

Given the on going, the researcher has standardized, at 5 metre, the woven length for the series of experimental weaving carried out on the loom. Apart

from enjoying a comparatively low loom waste factor, the production cost of each product of the experimental weaving comes out lower. This has made the pricing of these products competitive.

(b) Warp Take-Up

The extra amount of warp length necessary to go over and under the weft yarns is known as warp take-up. Held (1978), suggests, as being normal, an allowance of 10 per cent, in addition to the woven length. She further revealed that if either the warp or the weft is especially heavy or coarse, a greater allowance for take-up may be required. Since yarns used for both warp and weft in each of the experimental weaving on the loom are between the medium and fine count range, I have allowed 10 per cent for warp take-up.

(c) Shrinkage

As gathered through participant observation of weaving activities on the various types of looms; and as stated by numerous scholars, a woven fabric will always shrink when the loom tension is released. This type of shrinkage, known as relaxation shrinkage, is taken into consideration when deciding on the length of each warp for the series of experimental weaving on the loom.

The only truly reliable way to predict the amount of shrinkage a fabric will undergo is to weave a small sample, using same yarn envisaged for the main weaving. The sample is then subjected to all the usual factors responsible for shrinkage, taking careful measurements at each stage. But in the context of this study, following the suggestion of Held (1978), an allowance of 10 per cent extra warp length is taken to be ample. This is more so because yarns used for both warp and weft are conventional, smooth yarns, which are more stable than irregular and novelty yarns.

Since relaxation shrinkage, like any other shrinkage (steaming, washing and felting shrinkage, etc.), is affected by the composition of the fibre constituent of the yarn, the rate of shrinkage of the yarns used appears to be uneven. This can cause uneveness (resulting from area with the concentration of a particular yarn type drawn-in), in the woven length. Thus, in producing woven fabrics with even length - particularly in the instances where yarns of different compositions are combined in the warp (e.g., warp patterns consisting rayon and cotton yarns) - the researcher ensures that such yarns are fairly evenly distributed in the warp.

(d) Draw-in

Experience has revealed that as a fabric is woven, it always draws or pulls-in at the selvedges, no matter how hard the weaver tries to prevent this happening. As a result, the finished width of the fabric is usually slightly narrower than the sleyed width at the reed (i.e., width of warp drawn through the dents of the reed).

In deciding on the length of each warp for the series of experimental weaving - on the loom, a draw-in allowance of 10 per cent is taken to be adequate, as suggested by Held (1978).

4.3.2.1 Calculating Length of Warp

Taking congnizance of aforementioned factors, the length of each warp that results in the length of fabric desired, is determined using the following formulae:

Finished Length
\+ Loom Allowance
\+ Warp Take-Up Allowance
\+ Relaxation Shrinkage Allowance
= Dressed Length

For Example;

Finished Length = 5m

Loom Waste Allowance ($^{6.4}/_{100}$ x $^{500}/_{1}$ = 32cm) = 0.32m

Warp Take-Up Allowance($^{10}/_{100}$ x $^{500}/_{1}$ = 50cm) = 0.50m

Relax. Shrkage Allce.($^{10}/_{100}$ x $^{500}/_{1}$ = 50cm) = 0.50m

Dressed Length = 6.32m

4.3.2.2 Calculating Width of Warp

The width of each warp, resulting in the desired finished width, is calculated using the following formulae:

Finished Length

\+ Draw-in Allowance

\+ Relaxation Shrinkage Allowance

= Sleyed Width

For Example;

Finished Width = 62.0cm

Draw-in Allowance ($^{10}/_{100}$ x $^{62}/_{1}$ = 6.2cm) = 6.2cm

Relax. Shrkage Allce. ($^{10}/_{100}$ x $^{62}/_{1}$ = 6.2cm) = 6.2cm

Sleyed Width = 74.4cm

4.3.2.3 Determining Warp Set and Total Ends in Warp

The total number of ends required in each warp depends on two factors: the size or count of the yarn used; and the sett or density of the intended woven fabric. Experience has shown that indigenous fabrics, such as Aso-Oke, which are tightly woven and composed of relatively fine yarns, require a great many more warp-ends than open-work fabrics, made from coarse yarns.

Following the suggestion of Brostoff (1978), a simple method, used in determining the warp sett or density, involves the following: wrapping yarns used for each warp around a ruler, within an inch space (without overlapping, the yarn is laid as close together as possible); thereafter, the number of yarns are counted, and this represents the warp density, which is stated in ends per inch (e.p.i). This is so because the sizes of the reeds used on the loom for the experimental weavings are stated in dents per inch (d.p.i).

To arrive at the number of ends needed, the sleyed width and sett or density of - the warp are taking into consideration. The sett or density of the woven fabric depends on the e.p.i. The formula used is as follows:

Total Number of ends = e.p.i. x sleyed width - (in inches)

For Example:

If Warp Sett is 14 Ends/in (6 Ends/cm) and the sleyed Warp Width is 29 in (74.4cm)

then;

Total Ends in Warp = (14 x 29) Ends

= 406 Ends

4.3.2.4 Warping

Warping is a prelude to weaving. It is part of the process known as looming, beaming or dressing the loom. It is carried out in order to get the calculated number of warp-ends in the right sequence, having same length and tension.

Care is taken in preparing each warp on either a vertical warping reel or board. The well - prepared warps made the time spent at the actual weaving much easier, faster and enjoyable. Furthermore, the meticulous way in which the other looming related activities (spreading, drawing-in and sleying), are carried out, made the production of quality fabrics possible.

4.3.3 Decision on the Pattern of the Weaving and the Mechanic of the Loom Set-Up

Weaves are the designs (patterns), achieved in the cloth through an interaction between the way the warp is threaded through the heddles and the order in which the shafts are lifted. In order to explain concisely and quickly what the various weaves, produced during the series of experimental weaving on the loom, look like; how the warp yarn is threaded for each weave; and what levers are pulled to manipulate the shafts for shed formation; a shorthand language, called draft, is used.

Drafting is a system of notation used to represent, graphically, the appearance and mechanics of each weave. The complete draft or working plan for each weave, resulting from the experimental weaving carried out on the loom, illustrate the interlacing of warp and weft (cloth draft); the lifting sequence necessary to produce the shed (lifting draft); and the threading order through the heddles (drawing-in draft). Also, a special notation is used to show the sleying order, where this is different from the usual one-warp-end-to-each-dent order.

Drafting has often been compared to musical notation by most scholars. In some ways the analogy is accurate. However, unlike the symbols used in music, the shorthand of drafting is not universal, because different weavers prefer different weaving - draft systems. Consequently, the system used by the researcher is found to be simple, convenient, and probably quite common.

(a) Drawing-in Draft

This refers to the order in which the warp-ends are threaded through the eye of the heddles, following a predetermined sequence. In the context of this study, the drawing - in plan (draft) is written at the top of the working - plan. The lower row of squares represents the first shaft and the upper row denotes

the last shaft of the loom (i.e., from bottom to top as the shafts occur from front to back on the loom). Each square, of the eight rows of squares denoting the shafts, represents a heddle. The symbol (0) placed in any one of these squares shows a heddle through which a warp-end has been threaded. Figure 4.3 is a diagrammatical representation of one repeat of a straight drawing-in draft on an eight-shaft loom. It shows each warp-end being withdrawn from the warp roller, threaded through - the eye of the heddles and the dents of the reed. The numerical representation of the drawing-in draft is as follows: 8,7,6,5,4,3,2,1 (as indicated by the arrow, it is read from right to left).

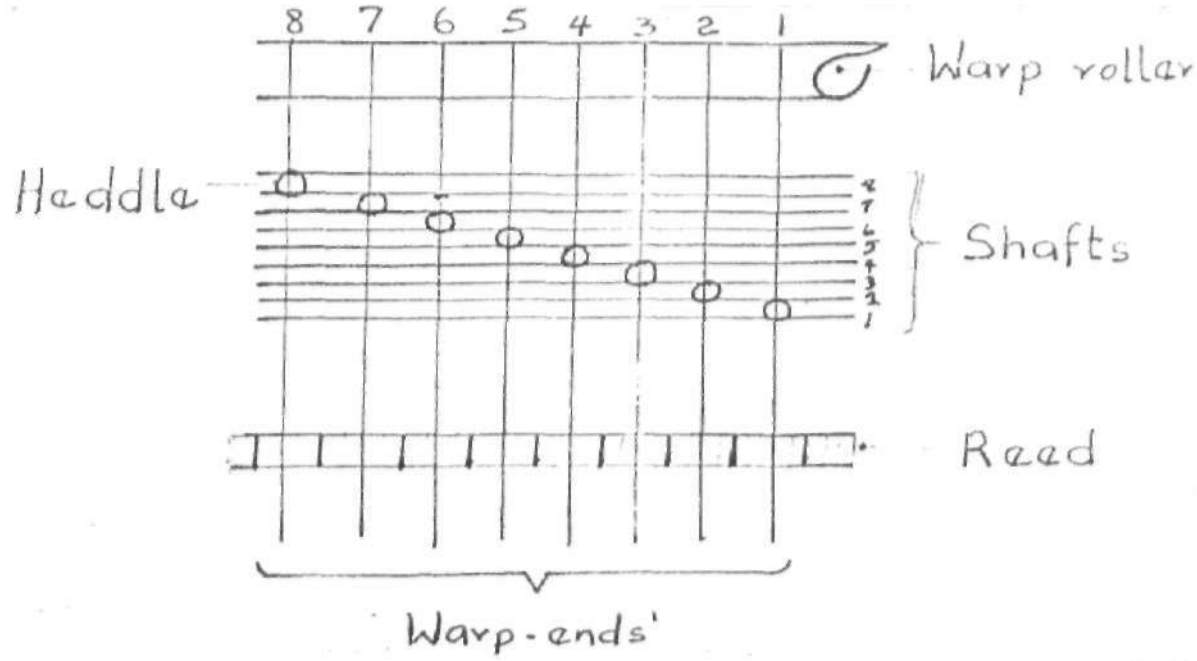


Figure - 4.3

(b) Determining the Number of Heddles Required on Each Frame

Though it is possible to add extra heddles onto, and remove excess ones from, the frame whenever the need arises, it is however, pertinent, in order to carryout the drawing-in process un-interrupted, to predetermine the number of heddles that will be required on each shaft. This act depends on the drawing-in draft. when a simple threading, such as the straight - draft is used, an equal number of heddles will be required on each frame. For some fancy or complex drawing-in draft (see Figure 4.4), an uneven number of heddles will be required. In view of the latter instance, it becomes necessary to produce the drawing-in draft, showing the selvedges, on graph paper when making preparatory calculations.

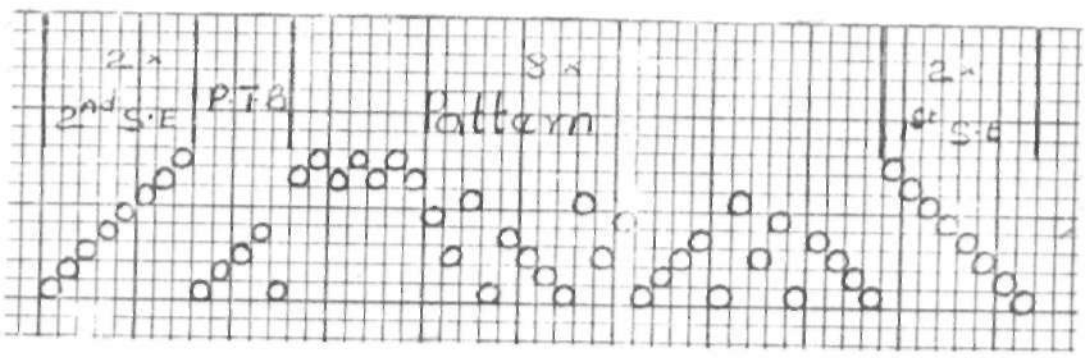


Figure-4.4: Illustrates a Fancy Drawing-in Draft Segmented into First Selvedge (1st S.E); Pattern; Pattern to, Balance (PTB); and Second Selvedge (2nd S.E); as well as Showing How Many Times Each Section Repeats

This has made it easy to see, at a glance, how many warp-ends are required to balance the patterns correctly; how many heddles will be required on each frame; and in which direction the selvedges should be threaded.

In the case of the drawing-in draft in Figure 4.4, it can be seen that the pattern, which repeats on 31-Ends, requires 5-Ends to balance it correctly, and 8-Ends for each selvedge. Before the number of heddles that will be required on each frame can be calculated, it is necessary to know the total ends in the warp. If the warp is to be 20 inches wide, with a density of 14-Ends per inch, there will be 280-Ends (20 x 14), altogether. From this total, the number of ends for the selvedges are subtracted; 280 - 16 = 264-Ends. Thereafter, the number of ends to balance the design after the last pattern are subtracted: 264 - 5 = 259-Ends. The remainder is then divided by the number of ends in the pattern: 259 ⁄ 31 = 8 pattern repeats and 11 odd ends. The problem now is what to do with the 11 odd ends.

If the aforementioned ends are done away with, it will considerably reduce the width of the warp. This is because the warp sett is 14-Ends per inch, and this

makes the 11 odd ends almost an inch wide. However, adding extra 5-Ends to the total ends in the warp will result to adding less than half an inch to the warp width. Thus, instead of reducing the warp width by almost an inch, it will be logical to increase it by less than half an inch, which might invariably prove insignificant. In view of this decision, 5-Ends are added to the 11 odd ends to make it up to 16-Ends, which are then added, 8 a-piece, to the selvedge - ends.

Now that the total ends in the warp is 285-Ends, 32-ends are subtracted from it for the selvedges: 285 - 32 = 253-Ends. From this 5-Ends are subtracted to balance the design: 253 - 5 = 248-Ends. This is then divided by 31, the number of ends in one pattern: 253 / 31 = 8 pattern repeats. Referring to Figure 4.4, the number of heddles that should be on each frame is determined by counting, one row of squares after the other, (i.e., squares with symbol, in the selvedges, multiply by the number of repeat; pattern-to-balance; and the pattern multiply by the number of repeat). The outcome of this exercise is the number of heddles required on each frame. This calculation is simplified and presented in Table 4.1.

Frames	1	2	3	4	5	6	7	8	Total
Selvedges (2 x each)	4	4	4	4	4	4	4	4	32
Pattern-to-Balance	2	1	1	1	-	-	-	-	5
Pattern (8 x each)	(6x8) 48	(3x8) 24	(6x8) 48	(3x8) 24	(3x8) 24	(3x8) 24	(4x8) 32	(3x8) 24	248
Total	54	29	53	29	28	28	36	28	285

TABLE - 6.1: A Simplified Method of Calculating the Required Number of Heddles on Each Shaft.

(c) Lifting Draft

The lifting draft, also known as lifting plan, indicates the order of sheds that are created for a design (weave) through the manipulation of the shafts. The horizontal row of squares represents the shafts, while the vertical rows signify the sheds or picks. The symbol (x) placed in any of the horizontal row of squares denotes the shafts that are lifted. The picks are read from bottom to top, just as weaving on the loom starts from the breast beam and progresses forward towards the whip-roll (warp-roller) - i.e., from front to back or bottom to top. Figure 4.5 is a graphical representation of a repeat of lifting plan with which a balance $^{1}/_{4}$ twill weave can be produced on an eight - shaft loom. The numerical representation of same, shown below, is read from left to right, as indicated by the arrow.

1-2-3-4, 2-3-4-5, 3-4-5-6, 4-5-6-7, 5-6-7-8, 6-7-8-1, 7-8-1-2, and 8-1-2-3

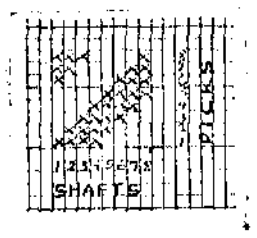


Figure - 4.5: Lifting Draft

(d) Cloth Draft

The cloth draft, also referred to as the weave draft, draw-down draft, pattern draft or design draft, is a point or graphpaper representation of the interlacing order of the warp and weft. It shows in graphical form what the weave looks like.

In preparing the cloth draft, two conventions are followed: the vertical rows of squares represent warp-ends, and horizontal rows signify weft picks; the shaded squares denote interlacing points, where the warp-ends are lifted above the weft-picks (warp over weft). The unshaded squares imply the reverse (i.e., weft over warp). In the context of this study, the cloth draft reads from bottom to top, the same way the woven fabric appears on the loom. Figure 4.6 shows the weave that will result from the interaction of the drawing-in and lifting drafts in Figures 4.3 and 4.5 respectively.

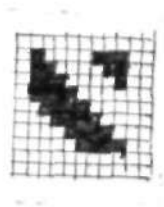


Figure - 4.6: Cloth Draft

(e) Working Plan

By pulling together all the foregoing elements (i.e., the drawing-in, lifting and cloth drafts), a comprehensive draft, otherwise known as full, complete, or working plan, is created. It shows on just a few square inches of point or graph paper, the appearance of the weave and all the mechanics that produced it. The working plan for each experimental weaving on the loom is presented in the following manner: the drawing-in draft is located at the top of the graph paper; situated directly under it, separated by some rows of squares, is the cloth draft; and to the right of this, also separated by some rows of squares, is the lifting draft. Figure 4.7 shows a comprehensive draft, repeating on eight ends by eight-picks, developed by pulling together the elements in Figures 4.3, 4.5 and 4.6.

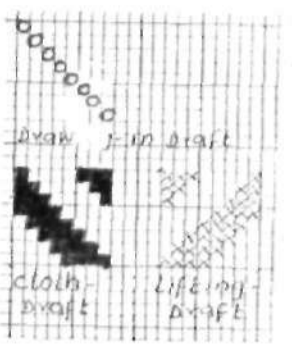


Figure - 4.7: Working Plan

The manner in which the warp yarns are set up on the loom is so crucial to the appearance of each fabric evolving from the series of experimental weaving on the loom. For this reason, the amount of time and energy expended in planning the loom set-up is more than what is spent in actually weaving the web.

In the discourse that follows, considerations of the mechanics of the loom set-up and weave; sample of materials; and other technicalities, are presented in an all embracing, concised format, referred to as the technical information. (see Figures: 4.8 - 4.15).

4.4 PRODUCT DEVELOPMENT

We often hear the expression, "form follows function". This implies that a work of art or industry is not successful if it does not fulfill the purpose for which it is intended. Thus, a woven fabric intended for an unbrella, that is physically beautiful, but does not keep out the rain, is not effectively designed; in the same light, an upholstery fabric, that is so overdecorated as to discourage sitting, fails in its function, and therefore, in its form.

TECHNICAL INFORMATION

EW/01

Cloth Width: 3 Inches Cloth Length: 2 yards

Yarn Type:	Warp	Weft
	(a) N/Blue-Cotton	(a) N/Blue - Cotton
	(b) Yellow - Cotton	

Yarn Count:	Warp	Weft
	(a) 0.9 dtex	(a) 0.9 dtex
	(b) 10 dtex	

Warp Setting: (a) 14 e.p.i (b) 28 e.p.i Warp Width: 3 Inches

Weft Setting: 19 P.P.I Reed Dentage: 20 d.p.i

Denting Order: 1.1.-1.1.-1.1.-1.1.-2.1.1.1.1.-1.1.-1.1.-1.1 (7x)

End-Use: Men's Shoe

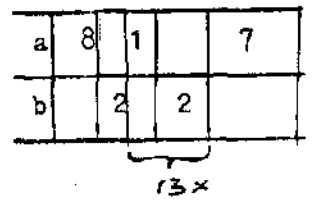
Warp Sample(s)



Weft (Sample(s)



Warp Pattern



Weft Pattern

plain

Working Plan

see Figure - 4.8

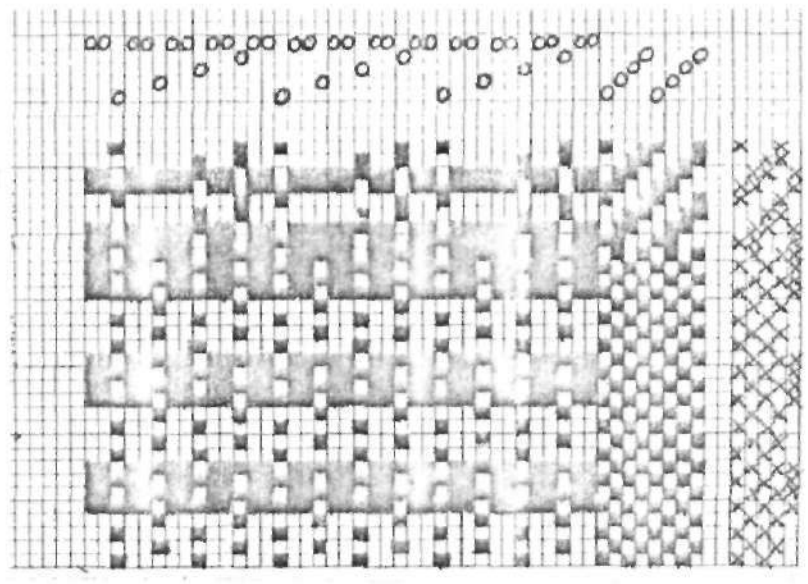


FIGURE - 4.8: Working Plan for EW/01

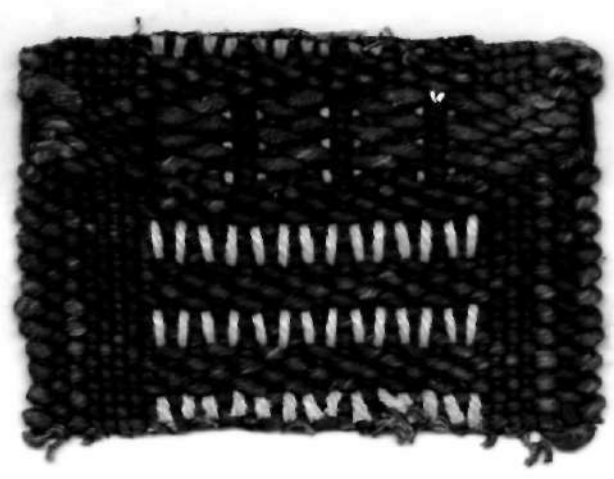


FIGURE - 4.9: Resultant Fabric Sample From EW/01

TECHNICAL INFORMATION

EW/.02.....

Cloth Width:.6 Inches..... Cloth Length:.2 Yards.....

Yarn Type:	Warp	Weft
	(a) N/Blue - Rayon - 2ply	(a) Black - Cotton - 1 ply
	(b) Cream - Rayon - 2ply	(b) Cream - Rayon - 2ply
	.....	.....
	.....	.....

Yarn Count:	Warp	Weft
	(a) 32.4 tex	(a) 30 tex
	(b) 34 tex	(b) 34 tex
	.....	.....

Warp Setting:..74 e.p.i..... Warp Width:..6½ Inches...

Weft Setting:..23 e.p.i..... Reed Dentage:..20 d.p.i...

Denting Order:.4-4-3-4-4-3-4-4-3-4-4-3-4-4-3-4-4-3-4-4-3-4-4-3-4-4-3-4-4

End-Use:.....Men's Shoe and Face-Cap.....

Warp Sample(s)



Weft (Sample(s)



Warp Pattern

a	12	12	12	12
b		2		2

Weft Pattern

a	4		4		4	
b		1		1		1

Working Plan

see Figure - 4.10

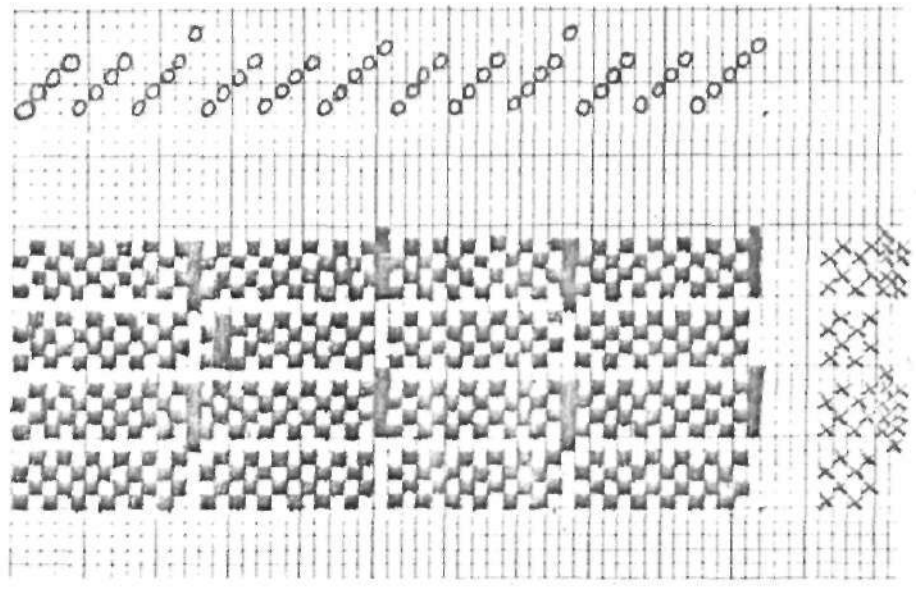


FIGURE - 4.10: Working Plan for EW/02



FIGURE - 4.11: Resultant Fabric Sample from EW/02

TECHNICAL INFORMATION

EW/.03.....

Cloth Width:.6 Inches..... Cloth Length:.2 Yards.....

Yarn Type:	Warp	Weft
	N/Blue - Rayon - 2ply	Black - Cotton - 4ply
	.....	.....
	.....	.....
	.....	.....

Yarn Count:	Warp	Weft
	32.4 tex	30 tex
	.....	.....
	.....	.....

Warp Setting:.68 e.p.i..... Warp Width:.6½ Inches.....

Weft Setting:.23 p.p.i..... Reed Dentage:.20 d.p.i..

Denting Order:.3.3.3.4.3.3.3.4.3.3.3.4.3.3.3.4.3.3.3.4.....

End-Use:.Men's Shoe and Face-Cap.....

Warp Sample(s)



Weft (Sample(s)



Warp Pattern

plain

Weft Pattern

plain

Working Plan

see Figure - 4.12

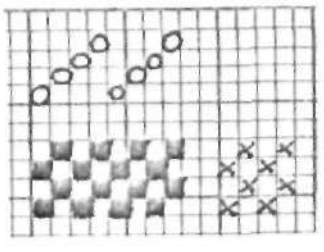


FIGURE - 4.12: Working Plan for EW/03



FIGURE - 4.13: Resultant Fabric Sample from EW/03

TECHNICAL INFORMATION

EW/.04....

Cloth Width:.12 Inches. Cloth Length:.3 Yards.....

Yarn Type:	Warp	Weft
	(a) N/Blue - Rayon - 2ply	(a) Black - Cotton - 2ply
	(b) Green/purple - Cotton/poly - 2ply	
	(c) Red/purple - Cotton/poly - 2ply	
	(d) Yellow - Rayon - 2ply	

Yarn Count:	Warp	Weft
	(a) 32.4 tex	(a) 30 tex
	(b) 44.8 tex	
	(c) 44.8 tex	
	(d) 34 tex	

Warp Setting:.....68 e.p.i..... Warp Width:.15 Inches.....

Weft Setting:.....16 p.p.i..... Reed Dentage:.20 d.p.i.....

Denting Order:.3.4.3.3.4.3.4.3.3.4.3.4.3.3.4.3.4.3.3.4.....

End-Use:.....Ladies Handbag and Slippers.....

Warp Sample(s)



Warp Pattern

A	68		10		10	68
B		16				
C				16		
D			8		8	

Weft (Sample(s)



Weft Pattern
plain

Working Plan

see Figure - 4.14

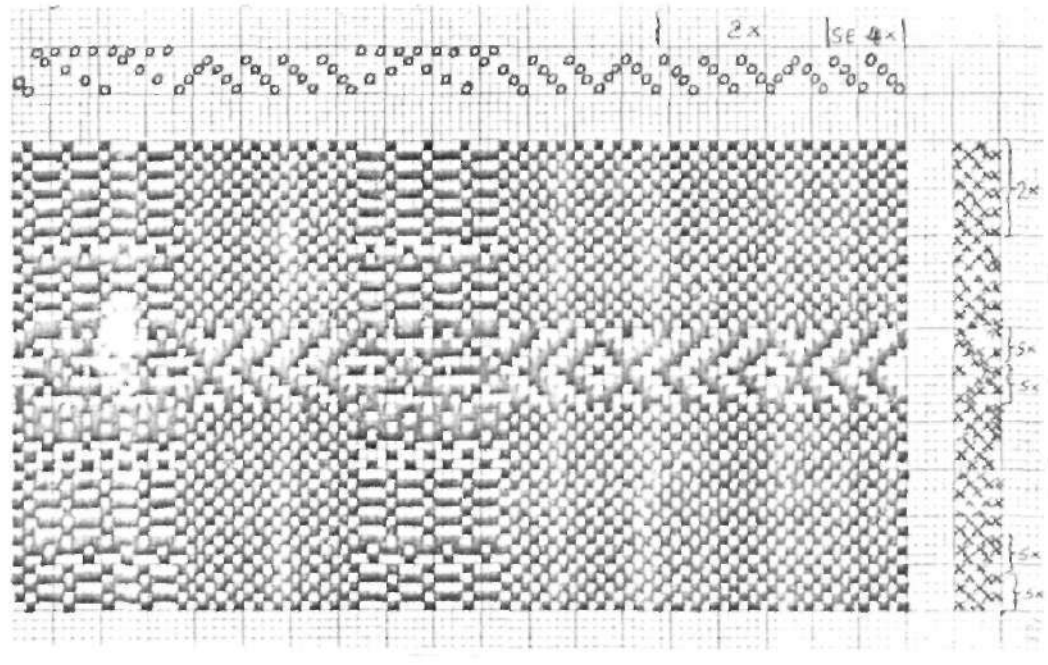


FIGURE - 4.14: Working Plan for EW/04

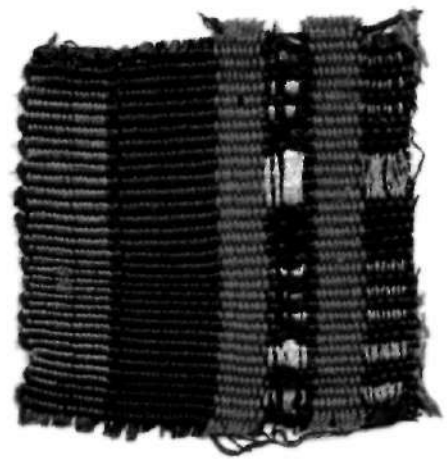


FIGURE - 4.15: Resultant Fabric Sample from EW/04

Consequently, the researchers concern, in carrying out the series of experimental weaving on the loom, is not with designing per se, but with creating effective designs, that will fulfill the requirements for the intended purposes. The researcher's acquaintance with some available raw materials for weaving, resulted in the choice of those ones, best suited to each end-use (see Plates: 7 - 11), in that each material provides its own kind of comfort, durability, and aesthetic potential.

The products (Plates: 7 - 11) developed from the resultant fabrics, while in line with the objective of this study, are by no means the ultimate. They only serve to illustrate what can be done with the fabrics produced. The meticulous manner in which they are executed, resulted in products that convey an excitement or awakening a pleasurable response. The acceptance and demand for these products can be related to their coming out as something that cannot be easily and economically duplicated through mass production.



PLATE - 7: Some Articles Made withFabrics Woven on the Fabricated Loom. Samples of yarns Used are also included



PLATE - 8: Samplers Showing Variety of Woven Patterns. Result of Experiments with Various Types of Fine to Medium Size yarns. Each is the Expression of Individual Ideas and Taste, and the Difference is seen in Colour, Pattern, and above all, in Texture.

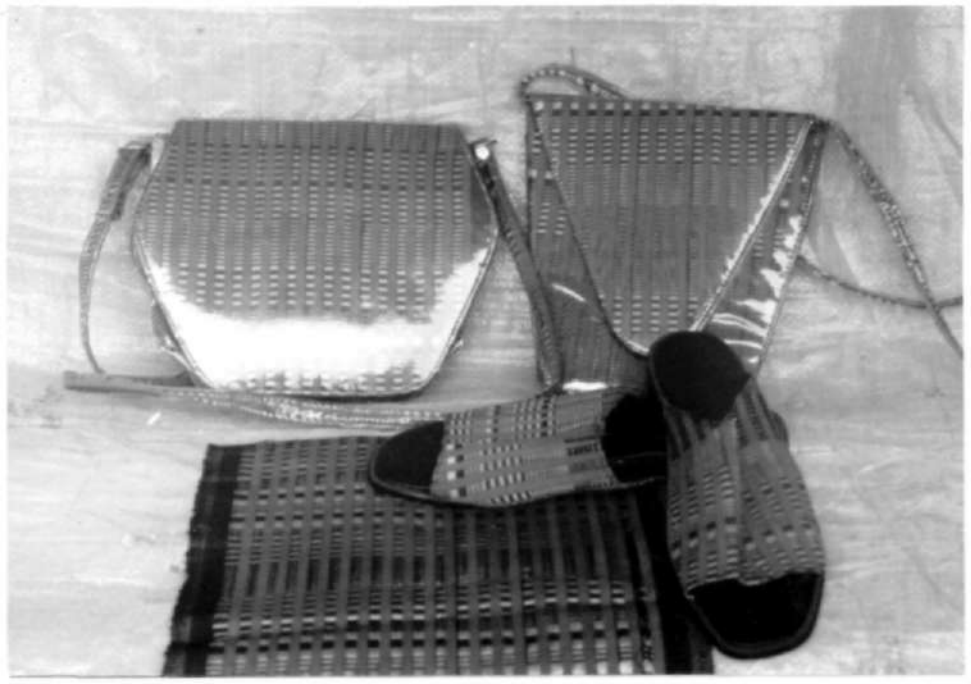


PLATE - 9: Two Fashionable Ladies Hand-Bags, with Foot-Wear (Slippers), to Match. These Fashion Accessories would go with Various Colour Combinations



PLATE - 10: An Office-Bag and a Travelling Bag, Apart from Being Water Proof, their Aesthetic Value is Preserved as well with Polythene Covering



PLATE - 11: Co-ordinated Articles. Men's Fashionable and Occasional Shoe, with a Face Cap to Match. Resultant Fabrics from Experimental Weaving (see EW/01-03), on the Fabricated Loom were used in Producing them. The said Fabrics can be seen around the Shoe.

CHAPTER - FIVE

SUMMARY CONCLUSION AND RECOMMENDATION

5.1 SUMMARY OF THE STUDY

This study focused on weaving craft because of its role within the context of self-reliance concept - a goal seriously being pursued in Nigeria today. Specific concern of the study centered on three areas: Fabrication of a modified, relatively inexpensive table-loom, using local materials; conducting experimental weaving on the said loom, using conventional factory made yarns, self-dyed, if need be; and utilising the resultant fabric for product development.

In addition to exploration from the social situation, related literature was reviewed in the following areas: historical evidence of weaving craft; evolution of the loom; types of looms and their structure; weaving processes and techniques; and raw material for weaving. The examination of these literature materials provided a suitable context for data collection. Accummulated scholarly knowledge in the areas of loom structure and raw materials for weaving, enabled the researcher to identify materials and data required for the study, which are collectable through the primary source.

Drawing from these theoretical framework, an appropriate research design, the Research and Development (R and D) approach, as suggested by Adetoro (1997), was used. To facilitate the procedure for material and data collection, as well as to give greater credibility to the research result, variety of instruments were used, as recommended by Pelto (1970). Photography, being a medium of research instrument, (Collier), photographs were taken at various stages, both at the carpentry workshop and weaving studio, to supplement other instruments - oral inquiry, observation, etc.

It was discovered that the loom, which was fabricated from 100 per cent local materials, compared favourably with existing manual looms; and performed well for a good range of hand-woven fabrics. The products developed from the resultant fabrics were found to convey excitement or awakening a pleasurable response.

5.2 CONCLUSION

The economic exigency, which the country has been grapping with for some time now, has made both the Government and the Governed to recognise the role of weaving craft in the socio-economic and cultural growth of Nigeria. In the context of the policy of local sourcing and backward integration, formulated and vigorously pursued for self-

reliant development and rural industrialization, it has been discovered that this study will contribute meaningfully. This is evident in its results, which exemplifies this inward looking policy of the Nigerian Government. The study gave practical demonstration of learning by doing in the manufacturing and the development of indigenous technology, relevant and appropriate to our resource endowment.

It was revealed that weaving craft constitutes a significant aspect of Nigeria's culture, in that it has value and meaning to a large proportion of Nigerians. Furthermore, the need to improve and develop tools and techniques, in order to sustain and preserve our cultural heritage, was evident. ' One other area in which the significant role of this study was apparent is in the labour employment and education.

An attempt to mass-produce the loom, will create employment opportunity for numerous wood-craftsmen, blacksmiths and those engaged in other relevant areas required. Also, the loom, in the hands of craft weavers will generate, as well as boost employment opportunities. More interested people can take-up weaving-craft as an occupation. Employment opportunity will also be created for the people in weaving geographical setting, through the marketng of the woven products; manufacturing and sales of

raw materials for weaving. As an instrument of education, the results of this study, particularly the loom, provide the means of disseminating weaving craft knowledge on a wider frontier. This is applicable to both the formal education system, and the informal one, where master craft weavers used the apprenticeship system for cognitive orientation of the recruits; and control their behaviour through the general processes of watching, listening and imitative action.

The outcome of this study is by no means the ultimate. Rather it represents the method of revealing the results of the researcher's investigation. Thus, efforts have been concentrated mainly on loom fabrication (following the working diagrams correctly); and experimental weaving (exploring the mechanics of loom set-up and weaves). As a pioneering effort at constructing a table-loom of this kind, using 100 per cent local material, there was the need to address the issue from both theoretical and practical perspectives. In this light, an approach of putting heads together in order to solve the problem was used.

5.3 PROBLEMS ENCOUNTERED DURING FIELD WORK

At the commencement of the field work, despite the personal contact and the past rapport developed with the resource persons, local market traders, and staff of trading

stores, there were inevitable difficulties to contend with. Within the context of the social situation, certain elements, such as communication, mistaken identity; time and financial constraints; and transportation; became issues to grapple with during the field study.

(a) Communication

There was no language barrier, since Yoruba, which is the native tongue of the researcher, is the general language spoken in the social situations, where the field work was conducted. This notwithstanding, some of the responses to oral inquiries were either evasive or very general; and often consisted of an avoidance of the issues. A likely reason for this action may not be far fetched from what is generally regarded as "trade secret" - whereby craftsmen and tradesmen refrain from divulging certain details or technicalities of their work process. There was an instance, when the respondent, in answering me said, "Ikoko obe mi ni yen" "that is my pot of soup" - meaning, his source of livelihood. At another occasion, precisely speaking, during the moulding of the ratchet wheels and catches at the blacksmith workshop, in response to one of my inquiries, the blacksmith asked; "Se O gbe'se wa ni, tabi o wa ko'se?" meaning "Have you brought a Job or you've come to learn one?".

The process of procuring certain materials in the local market, and of getting some jobs done by some resource persons were heightened by the African haggling, which economists say is the most effective price - stabilizing mechanism in the imperfect African market structure. More often than not, time and temper got shorter in the heat of haggling. However, reason eventually prevailed to impose a fair price upon the seller and the researcher. Quite often, both parties emerged in the end, not much worse or better off than each other. In retrospect, the researcher now views the issue as an exciting experience.

(b) Mistaken Identity

As indicated by Oguntona (1981), "It is evident that people often confuse or mistake researchers for journalists, who are more interested in catching sensational head-lines in their reporting". In view of this, there was the need to inspire confidence, and develop necessary rapport before the respondent can be persuaded to co-operate. This became evident in the respondent reaction to oral inquiry about what they are doing or the authenticity of the quality of their goods or services.

In the course of this study, people revealed an in-born aversion to any scholarly or academic type of inquiry, this is more so, when they saw a strange face with gadgets, such as camera and tape-recorder. They spurned the whole exercise and, all of a sudden, become suspicious. There was an instance when I was taken for an agent of the market union, on a mission to fish-out those traders who are not complying with the union's directive against undue hiking of prices. There was this other time when I was perceived as a local council worker, who is out to assess traders for tax purpose. On these various occasions, to establish my true identity was a problem.

(c) Time, Financial and Transportation Problems

For logistic reasons, the field work was embarked upon during the long vacation period. The need to come back in good time and register for the new academic session imposed limitation on the field study duration. As for the financial constraint, the prevailing adverse economic situation in the country does not help matter at all. The so called monthly salary is hardly sufficient to feed on for a week, talkless of settling the children school fees and other bills. To worsen the whole situation, the study leave with sponsorship granted by one's employer, only provides a stipend as

project allowance. Whereas one's area of study is financially involving. Thus, at every stage of the investigation, one had to grapple with the issue of obtaining the best at a minimum cost possible.

The issue of transportation would not have posed much problem, if not for the occurence of fuel scarcity during certain period of the field work. During this period, there were limited number of vehicles on the road; and the available few, hiked transport fare by as much as one to five hundred per cent.

The experience of this field work has under scored the need for the researcher to lay claim to being an absolute master of field work problems before going to the field. This is more so because respondents were very unpredictable. They could be receptive, amicable, sociable and co-operative this minute; and the next, they could be wary, sensitive to a fault, unco-operating, and apprehensive of previous research studies. In view of these operational problems, the researcher has come to a better understanding of the virtue of being cautious, patient, and humble - maintaining a low profile, which at times, necessitated working through some "Local Leaders" in order to secure confidence and co-operation of the respondents.

5.4 RECOMMENDATIONS

In view of the role of weaving-craft in the socio-economic and cultural growth of Nigeria, the much desired self-reliance can be attained by exploring avenues that can improve the efficiency of the craft, through the mass production of the loom. As more and more Nigerians are finding weaving - craft so lucrative, that they are taking it up as an occupation, they should not loose sight of the keen competition from factory made and imported goods. These goods will threaten to throw them out of work. However, the trusted weapons, with which to fight back are: the quality of their weaves; the beauty of the finished products; and their imagination and ingenuity in creating successful design.

Students of textile design should explore methods of making the indigenous hand woven fabrics more compatible to contemporary needs and acceptable to modern days consumers. Apart from the mode of patterning, a variety of weave structures could be experimented with, which could make the fabrics both comfortable to handle and wear. The fabricated loom can provide the means of achieving this.

It is imperative to state that not all localities are so richly endowed with some materals used in fabricating this loom. However, alternatives, appropriate for similar

purpose, abound across the country. As a result, it is strongly recommended that interested persons, wishing to take up the mass production of this loom, facing such a situation, should source for alternate materials. It has been revealed that without the loom, weaving remains a tedious business; and the product, very unsatisfactory. It is to this end that the researcher will further recommend that more and more textile scholars, particularly those in the area of design, should join, in the concerted efforts being made to improve and develop weaving craft in Nigeria, by investigating further, the issue of loom fabrication and product development.

5.5 SUGGESTIONS FOR FURTHER RESEARCH

The researcher does not wish to lay absolute claim to the invention of an eight-shaft, two-warp beam table loom, in the on-going efforts being made to develop weaving craft in Nigeria. However, the adaptive approach for fabricating such a loom, from 100 per cent local materials, is an innovation worth emulating by scholars and craft weavers, who may want to enjoy and extend the frontier of weaving craft from the common practice, to a more exciting practical fulfilment. If this loom is subjected to an unceasing, ardous study, and constant use, improvements in the

operational reliability; structural modification; reduction in cost and lower maintenance cost; may result.

This research is largely limited in several important respects. Those aspects of this study, which were not investigated suggest several areas that might be fruitfully examined in future. For instance, this study did not concern itself with the rigorous analysis of the quality of the fabrics produced on the fabricated loom. Quality in this context refers to the aesthetic and performance excellence, i.e., the ability to withstand any climate conditions over the years. Another limitation of this study, suggesting further exploration can be found in the shedding mechanism of the loom. Instead, of the levercord system of manipulating the shafts to effect shedding, a table loom with dobby mechanism attached to it can be investigated in the future. Furthermore, this present work could not accommodate the fabrication of loom accessories like: Warping Creel, yarn or Bobbin Winder, Heddle and Reed Hooks, etc. Future researcher can look into these areas.

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A P P E N D I C E S

APPENDIX - A



PLATE - 12: Woven Fabric on the Fabricated Loom



PLATE - 13: Product Development on Display During the Seminar: The Loom and Items Developed from its Products

APPENDIX - B



PLATE - 14: At the Seminar Venue: The Researcher, with His supervisor at the Background

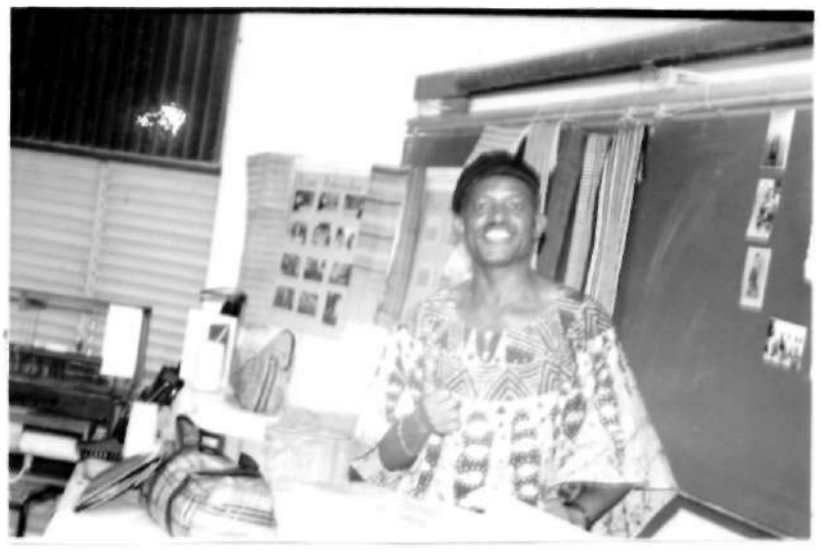


PLATE - 15: The Researcher During Seminar Presentation

Textile Section
Department of Industrial Design
Faculty of Environmental Design
Ahmadu Bello University
Zaria.

8th September, 1997.

The Post Graduate Co-ordinator
Department of Industrial Design
Ahmadu Bello University
Zaria.

Through:

The Major Supervisor
Department of Industrial Design
Ahmadu Bello University
Zaria.

9-9-97

Sir,

Following the approval of my research proposal and futher numerous discussion on same, I wish to intimate you of my intention to spend the holidays, conducting field study in my research area.

Relevant data on my research topic are available within Lagos state and its environ, where I shall be holidaying. Thus, considering the financial implication, the time and risk that will be involved, I feel it is proper for me to use the holiday to accomplish this aspect of my research.

I hope that this plan of mine will be acceptable to you and, that the understanding will be there if need be for me to resume late for the 1997/98 Session.

Yours faithfully,

Adet ayo O. Ayotade
MA/ENV.DES/09396/95-96

APPENDIX - D

Department of Ind. Design,
Textile Section,
Ahmadu Bello University,
Zaria.

27/4/98.

The Head,
Department of Ind. Design,
Ahmadu Bello University,
Zaria.

Through: The Major Supervisor,
Department of Ind. Design,
Textile Section,
Ahmadu Bello University,
Zaria.

Sir,

REQUEST FOR SEMINAR PRESENTATION

I have completed the course works as listed in the attached photo stat copy of letter of attestation dated 24th March, 1998 and signed by the Post graduate Co-ordinator. In view of this, I wish to request for an opportunity to present my seminar, which is a part-fulfilment of the requirement for the award of Master of Arts, Industrial Design degree.

I am forwarding, twenty-five copies of my seminar paper for this purpose.

While counting on your usual co-operation, I shall very much appreciate it if my request is favourably considered.

Thanks.

Adetayo .O. Ayotade

DEPARTMENT OF INDUSTRIAL ...
AHMADU BELLO UNIVERSITY, ZARIA - NIGERIA.

Head of Dept. Dr. B. A. Kparevana.
B.A.,(ABU) M.A.(ABU.) Ph.D.(LU.) U.S.A.
Sole Admin.: Maj. Gen. Shuwanan Kantagora (Rtd.)

Telephone Zaria 661

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APPENDIX - E

Your Ref:

Our Ref: ID/33/98

Date 24th March 199...

TO WHOM IT MAY CONCERN

I wish to confirm that Adetayo O. Ayotade was admitted into the M.A. Programme of the Department of Industrial Design under the 1995/96 Session with the admission number M.A./FnV.DES/09396/95-96. However lectures did not commence until 1996/97 Session because of the crises in Ahmadu Bello University in the previous session.

In the First and Second Semester of 1996/97 session Adetayo O. Ayotade offered 10 courses. Below are the courses and the grades.

InDE 505	Advance Studio	B
InDE 501	Advance Colour and Design	A
InDE 507	Principle in Specialising Area	B
InDE 503	General Research Techniques	C
InDE 717	Business Management	A
InDE 508	Conceptual Issue in Specialising Area	B
InDE 506	Advanced Studio Practice	A
INDE 502	History and Philosophy of DID. Design	B
InDE 504	Research Methodology	B
F.A.A 782	Experimental Drawing	C

Generally Adetayo O. Ayotade is doing well in his M.A. Programme.

Yours faithfully,

Dr. B.A. Kparevana,
Post Graduate Co-ordinator.

APPENDIX - F

Sample Yarn-Calculation Form

title/description of project _____

finished length _____

allowance for warp take-up (10%) _____

allowance for shrinkage (10%) _____

allowance for loom waste _____ ¾ yard

allowance for hems _____

total warp length _____

finished width _____

allowance for draw-in (10%) _____

allowance for shrinkage (10%) _____

allowance for hems _____

width at reed _____

sett: _____ (ends per inch) × _____ (width at reed) = _____ (total warp yarns)

warp quantity: _____ (warp yarns) × _____ (length of warp) = _____ (yards)

_____ (warp quantity) ÷ _____ (am't per spool/pound) = _____ (No. of spools/pounds)

weft quantity: _____ (width at reed) + _____ (10% take-up) = _____ (length of one weft)

_____ (weft yarns per inch) × _____ (length of warp) = _____ (No. weft shots)

_____ (length of one weft) × _____ (No. weft shots) = _____ (weft quantity)

_____ (weft quantity) ÷ _____ (am't per spool/pound) = _____ (No. of spools/pounds)