KWAME NKRUMAH UNIVERSITY OF SCIENCE AND

TECHNOLOGY, KUMASI, GHANA

CONCEALLING DEFECTS ON INDIGENEOUS TANNED LEATHER SURFACES: COLOURING MEASURES AS TECHNIQUES

By

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(B. A. INTEGRATED RURAL ART AND INDUSTRY)

MASTER OF PHILOSOPHY

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DECLARATION

I hereby declare that this thesis as embarked on in the Department of Integrated Rural Art and Industry for the award of MPhil. Integrated Art (Leather Technology) is entirely mine and that no part of this thesis has been published or submitted elsewhere for the award of degree. All sources used have been duly acknowledged.

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DEDICATION

I dedicate this research to the Lord God Almighty for his guidance and protection throughout my MPhil study. Also, to my parents and siblings for their prayers and to all individuals who contributed to the success of this thesis.

ABSTRACT

Good leather surface quality is very vital in leather artefact production. Having a bad or unpleasant leather surface for artefact production hinders patronage and appreciation of such products at large. Leathers produced locally by tanners and local leather craftsmen in their attempt to satisfy customers and also meet market demand encounter some surface disorders of some of these leathers that are used for producing artefacts. In light of this, this research aimed at concealing leather with colour as management techniques towards improving the surface quality of the leather and its products at large hence, addressing the following objectives; To identify and classify surface defects on locally tanned leather and leather artefacts, to explore the various colouring techniques to conceal defects on the indigenous tanned leather surface and to produce articles using the concealed indigenous tanned leather. The researcher in achieving the set objectives employed the qualitative research design where the experimental and descriptive approaches were used respectively to help identify, experiment and describe vividly towards its assessment and recommendation in that regard. Concealed leathers including insect bites, pale surfaces and stains were the most managed leathers. The study identified various surface defects associated with Ghanaian indigenous leathers and were categorized under two major areas namely Ante-mortem and Post-mortem defects. Defects such as scratches, insect bites, stains, pale surfaces or un-even dyeing and flay cuts. The researcher experimented with dyeing method, screen printing method and spraying method as strategies to conceal identified surface defects.

TABLE OF CONTENTS

TOPIC **PAGE**

LIST OF TABLES

TOPIC **PAGE**

LIST OF PLATES

TOPIC **PAGE**

CHAPTER ONE

INTRODUCTION

1.1 Overview

This chapter commences with the Background to the Study, followed by the Statement of the Problem, Objectives of the Study, Research Questions, Delimitation, Limitation, Definition of Terms, Significance of the Study, and Organization of the rest of the study.

1.2 Background to the Study

Due to weather conditions he was confronted with in the prehistoric period, the leather industry is a very early industry developed by humanity. Choosing a leather as a convenient material for protecting the body influenced its development over generations upon generation, with one generation improving upon the ideas and techniques learnt from the other. A very old and popular indigenous industry in Ghana is the leather industry, and it is largely practiced in the northern part of Ghana. Fortunately, few of these leatherworkers from the northern part of the country have established small-scale leather tanning industries in some towns and cities in Southern Ghana, particularly through the Ashanti and Greater Accra regions. According to Atiase (2004), the industry serves as a lifeline for several livelihood across the country.

The main raw material is the animal skin or hide; the hide is gotten from bigger animals, whiles skins are gotten from small animals. The skin or hide needs to be tanned and the tannery operation involves converting the raw skin or hide (pelts) into leather, a constant material, which can be used in the production of a various articles. In view of Habib et al, (2015), the Quality of raw hide has direct impact on ante-mortem defects such as scratches, rub marks, horn rake, yoke mark, scabies, pox, brand marks or post-mortem defects such as flay cuts, fleshing cuts, grain crack. However, ante-mortem defects pose

serious challenges to the tanners while post-mortem defects are controllable to some extent (John, 1997). Fundamentally, the leather industry in the country is built highly on leathers tanned by indigenous methods and techniques, and focuses on the production of leather and leather artefacts to serve both aesthetic and utilitarian needs of Ghanaians and beyond. Though the artefacts are conventionally made, and attract some patronage locally and by tourists, Boahin (2008) further expressed that they leave much to be desired since the material's defects and inefficiencies manifest particularly through the emission of offensive odour, mould development and poor finishing. Sharphouse (1995) emphasised that the peculiarity of hide and skin plays a pivotal role in determining the quality of produced leather and it constitutes about 50 – 70% of the cost of production. Leather industry, as with any industry today, is more concerned with quality. It produces variety of leathers such as upper sole, lining, suede garment, grain garment, glove, industrial and sports goods leathers.

In Ghana, the training offered by the indigenous leatherworker is through the traditional apprenticeship method, where the techniques for production are passed from one generation unto another and this is due to the fact that the extensive or the free range of farming where farmers allow their animal to roam in search of their own food and water. This exposes the animals to several dangers such as injuries from predators, insects and plant spikes or thorns. Some of the animals are sometimes injured by moving vehicles, insects, pest and human activities such as stone throwing and beatings from nomads or peasant farmers who follow them to graze. Injuries such as cuts and scratches which do not heal go a long way to affect the surface quality of leather and leather products produced from the skins of such animals, hence causing the low quality of leather and imperfections in leathers produced. In the quest of preventing these defect, certain

measures have been taken largely in various ways to conceal such imperfections in leathers.

Concealing defects in leather on a broader perspective can be referred to as methods or ways to basically prevent disclosure or recognition of defects on or in leathers. In a desperate attempt to implement ways to conceal defects, these are: stitching cut leathers, dyeing stained leathers and glue patching of thorn areas.

According to Kite and Thomson (2006) man has considered leather as a reliable material for attaining basic needs such as making footwear, tents, shields, sheaths, containers for liquids, boats and even armour from the Stone Age to the beginning of the Egyptian civilization through the Romans' domination till today. In developed countries such as United Kingdom, Italy, Germany, United States of America, and France, leatherwork has characteristically been regarded as a major contributing factor in the economic development and industrial transformation (Landmann, 2006).

Emerging economies such as China, India, Pakistan, Turkey, Kenya, South Africa, Brazil, and Argentina are currently counted among the global industrial giants in the field of leather production which are beefing up their economic development and stability with enormous revenues generated from exportation of various forms of cured raw hides, skins, finished leather and leather artefacts (Leather International, 2007).

Leather is a transitional industrial product which is also relatively cheap, durable and available. They are widely used for goods such as bags, shoes, furniture and many other articles of daily use in the world. Therefore, propose leather article determines the type of leather to use. The global market value for leather is $72 billion and that of raw hides and skin is $4.4 billion, growing steadily at 3% per annum (GEMS, 2012). Across the world leather industries are seen as one of the vital agricultural sub-sectors and also

have a great potential towards employment and economic growth in general (CBN, 2006). Gutherie (2003) suggested that there are enough financial records to show that, the contribution of the hide, skin and leather industry towards achieving economic growth through an expansion of hides and skin production, skin pre-cuts and the export market for both semi-processed and finished hides is huge and the only way to embrace such achievement is through value added initiatives.

1.3 Statement of the Problem

In Ghana, people prefer the use of leather to all forms of artificial imitations, due to its numerous relative advantages. On the other hand, the lack of modification has made the industry virtually inactive and unattractive. The industry produces leather from animals slaughtered in the country as well as conventional artefacts which provide job opportunities for several people in the country, especially the northern zone of Ghana.

Currently, majority of Ghanaians patronize foreign made leather artefacts more than the locally manufactured ones. Most of the respective producers of leather items normally use imported tanned leathers. The reason being that, the locally tanned leathers are of low quality. In the face of this problem, they choose to use both imported natural and artificial leathers in their work and go further to imitate the brand names of known foreign leather products. This is done to create an impression for consumers to purchase them.

With the increase in the population of the country and the versatile nature of skins and hides have brought about higher demands which have resulted in a keen competition regarding the acquisition of skins and hides by consumers as food (meat) which is locally called, “wele or kawuro” and also for making leather. In the light of this

challenge, tanners mostly ignore the proper assessment of the skins and hides for the production of leather.

However, the Quality of leather is directly impacted by ante-mortem or post-mortem defects. This problem can affect the quality of leather produced in the country. The surface defects on leather affect the physical look of leather goods and the amount of usable area. The presence of defects is vital for improvement of the leather for creating of particular goods, because the existence of areas with leather defects may render the sample useless or useful only for a particular purpose. It is therefore necessary to research into how to conceal the defects of skins and hides surfaces in relation to leathers produced in Ghana.

It is in light of the above discussions that the research sought to identify the various defects on locally tanned leathers, leather artefacts, and classifying them. It also sought to explore the various existing colouring techniques for concealing defects of indigenous leather surfaces, and to finally produce articles using the indigenous leather with concealed defects. Pictures from plates 1.1 and 1.2, represent surface defects of post-mortem and ante-mortem identified on local indigenous tanned leather.

Plate 1.1 A and B: represents scars and stains (post-mortem defects)

Plate 1.2 A and B: represents insect bite and scratches (ante-mortem defects)

1.4 Aim of the study

The aim of the research is to conceal defects on indigenous tanned leather surfaces using the colouring technique.

1.5 Objectives of the Study

1. To identify and classify surface defects on locally tanned leathers and leather artefacts
2. To explore the various colouring techniques to conceal defects on the indigenous tanned leather surfaces.
3. To produce artefacts using the concealed indigenous tanned leathers.

1.6 Research Questions

1. What are the existing defects on the surfaces of locally tanned leather and leather artefacts?
2. What colouring techniques can be harnessed by local tanners for concealing defects of leather surfaces?
3. What kind of articles can the concealed indigenous tanned leather be used in producing?

1.7 Delimitation

The research has two focal areas thus, experimenting three defect categories namely, surface texture defects, colour defects and holes or scars. Secondly, exploring the various colouring techniques such as dye methods, screen printing and spraying method to conceal defects on indigenous leather to improve leather quality for article

production. The research environment selected for the study is the Aboabo Local tannery in Kumasi where local tanners will be interviewed and observation will be made for the authenticity of the research.

1.8 Definition of Terms

Leather - *An animal skin/hide made smooth and flexible by removing the hair and then tanning.*

Pelt - *Body covering of a living animal, either skin from a small animal or hide from a big animal in the raw state.*

Skin - *A natural protective covering of the body of a small animal.*

Hide - *The raw skin of an animal (especially a large animal).*

Flaying – *Stripping off the skin/hide of an animal.*

Tanning - *Treating skins and hides with tannins so as to convert them into leather*

Ante-mortem defects – *defects inflicted on the skin or leather before death of animal*

Post-mortem defects – *defects inflicted on the skin or leather after death of animal*

1.9 Significance of the study

1. The outcome of the study will create awareness among the local tanners on the use of colouring techniques to concealed defects on indigenous leather.
2. The research findings will contribute to the development of the quality of skins and hides for leather produced in Kumasi.
3. This thesis will act as a body of knowledge and reference for other researches.
4. It will serve as documentation on concealing defects on indigenous leathers produced in Kumasi.
5. It will help increase the economic benefits of the local tanners in Kumasi.

1.10 Organization of the study

The research is presented in five chapters. The first Chapter gives the Background to the study, Statement of the problem, Objectives of the study, Research questions, Delimitation, Limitations, Definition of terms, Significance of the study, and finally, the Organization of the rest of the study. Chapter Two elaborates on the theoretical and empirical literature review. The methodology shall be presented in chapter three. Chapter Four comprises the data presentation, analysis and interpretation of findings. Finally, the Chapter Five presents the summary of the entire research, conclusions and recommendations.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

2.1 Overview

The purpose of this study is to conceal the defects on the surfaces of the Ghanaian indigenous leather in leather production. In this study, the researcher reviewed relevant related literature on leather, history of leather, Leather defects, and techniques for concealing Leather defects, Construction of various leather articles and impact of leather with concealed surface defects.

2.2 Theoretical Framework of the Study

Historically, the value attached to leather influenced the vigorous efforts put in by prehistoric man to make it better preserved. Consequently, numerous approaches were made to improve upon the quality of leather they wanted to produce. The serious attentions paid to the development of quality leather in the early life of man within a wider geographical zone indicated its importance for the development of civilization.

As explained in Fiero (1995) and Boahin (2008), the indigenous leather industry follows a humanistic tradition which controls nature for survival: by depending on local raw materials to focus on the production of leather artefacts to project and protect the cultural legacy of the people and also to serve the needs of Ghanaians and tourists who visit the country. Skins and hides are tanned into leather for the production of artefacts ranging from containers, clothing, and upholstery to decoration (Boahin, 2005; 2008). Prominent artefacts among them includes skins for all kinds of traditional bags, slippers, wallets, footrest, and knife sheaths, drums, sunshields for farming in the dry season, talisman and amulets.

Primarily, the quality of an indigenous leather is directly influenced by ante-mortem defects (scratches, rub marks, horn rake, yoke mark, scabies, pox, brand marks etc.) or postmortem defects (flay cuts, fleshing cuts, grain crack). As byproduct of meat industry, no special attention is normally bestowed to develop the quality of leather and hence a tanner has to make the best use of the available raw material by sorting them out into various categories depending on the post and ante – mortem defects. The surface blemishes on leather affects the physical look of leather articles and the amount of usable space. The leather industry today, as with any industry, is more concerned with quality. It produces variety of leathers such as lining, upper sole, suede garment, grain garment, glove, sports goods and industrial leathers.

In the view of Boahin (2005), the indigenous leather industry lacks economic motivation, confidence and market penetrative competence which probably stem from poor technological approaches employed in the production of leathers. As a result, the nation has not been able to harness the full economic potentials of the industry to its advantage. Meanwhile, Leatherwork stands as one of Ghana's indigenous industries capable of job and wealth creation to help curb poverty and the high unemployment situation.

The existence of blemishes is a vital cause for improvement of the leather for production of certain artefacts, because the presence of areas with leather defects may render the sample useless or useful only for a particular purpose. This amplifies the crises in which the industry is and the urgent need for pragmatic problem-solving ideas (Boahin 2005, 2008).

2.3 Historical Background of Leather Industry

The influence on leather education is dated back as old as the early discovery of leather. The prehistoric man saw the need to search for a more convenient material to protect him

other than the tree barks and leaves he was wearing and that was when the history of leather begun from. Man saw the pelt of animals to be a more convenient clothing material to withstand the harsh weather conditions. Due to man's serious efforts to improve upon its choice and quality of pelt available to him, the leather industry was gradually discovered. The pelt which has gone through a chemical process known as tanning to prevent it from decay, is therefore called leather. It allows gases or vapour to pass through but it is impervious to liquids. The prehistoric man came by the use of leather through the attempt to make clothing from the skins obtained from hunting and breeding but they became hard and decay in heat. When he found out this occurrence, he sought for more convenient ways of preserving it. The desire to preserve leather properly led the pre-historic man to make several efforts at different periods to find improved technologies.

One most interesting aspect of the pre-historic man's efforts was how he discovered the use of vegetable tanning. This tanning may have occurred from identifying the valuable effects of hides that had soaked in pools of water and absorbed tannin, tree bark, or from deliberate attempts to dye skins with the juice of bark, berries or nuts.

The desire of man to find a more durable and soft leather for use led to continuous search for a means of achieving this goal. The World Book Encyclopaedia (1972) indicated that;

...North American Indians made a yellowish type of leather called buckskin from deer-skins. They piled the skins in packs so the tissue surrounding the hair rotted off. They scrapped the flesh from the inner side of the skin by hand and pounded oil and the brains of animals into the skin. Then they let it hang in thick smoke. They produced good, soft leather...

The value attached to leather in the pre-historic era influenced the vigorous efforts put in to make it better preserved. In the approach to improve upon the quality of leather they wanted to produce, The World Book Encyclopaedia (1972) further stated that:

…The processes of sweating and enzymatic hair removal are all based on early discovery that hair will fall out of a hide that has been allowed to rot slightly. Wood-ash and lime were used in the Middle Ages. Much later, the cleaned hides were treated with dog dung and drenched in fermented broth. These procedures were later replaced by acid deliming and bating with enzymes. Bating is a treatment of light type of leather to attain a smoother and clearer grain, or greater softness and pliability. In this process, hides are placed in vats containing ammonium sulphate or chloride as the deliming agent and certain enzymes that act selectively to remove proteins and also to improve colour…

As civilization grew in the early days of man, different people used different materials and technologies to treat leather. In the World Book Encyclopaedia (1977), it explains the technologies used by different people by saying that:

…Eskimos may have rubbed into animal skins to make the fur soft and durable. This may have been the beginning of the use of oils for tanning (a process termed oil tannage), and of chamoising (art of making skins and hides extremely soft).

For the Babylonians and the Assyrians to produce the varieties of leather for different purpose, they used alum, oil, myrrh and sumac for tanning. Tanning has had a long and popular history among the people of Northern Africa, particularly in Egypt and Morocco than the rest of Africa, archaeological evidence has revealed variety of leather articles used in ancient Egypt. Pieces of leathers have been found in Egypt that date as far back as 1300 B.C. Beside the North African countries, leather tanning had also been practiced in East and Southern Africa countries extensively; this is due to the availability of large

herds of cattle and animals in the wild and the need to acquire containers and clothing products for daily use. It is believed that, tanning could have spread to the rest of Africa through interaction with Arabic traders and Islamic preachers from North Africa.

Northern Nigeria is identified as one of the famous centres for professional leather tanning in West Africa. People from Northern Nigeria, the Hausa, Fulani, Tuareg, and Kanuri have carried to great heights the art of leatherworking. Through migrations, Craftsmen from Northern Nigerian States migrated to other Nigerian States and other West African countries including Ghana, to practice the vocation. Tanning of leather became a secret tradition among the people, where transfer of skills virtually revolved among family members.

The information on early professional tanning in Ghana, is based on oral history, leather tanning was only common among drum producers who were court artists but was not very popular among the indigenous people. Some of the Northern Nigeria immigrants settled in some cities in the Northern Ghana such as Tamale, Wa, Bolgatanga and Yendi to practiced leather tanning as family vocation. Subsequently, some of these leatherworkers migrated to settle in Kumasi, and few of them were employed as court artist in the palace of the Asantehene (King of the Ashantes). They were made to produce some royal regalia such as traditional sandals (Ahenema), poufs, amulets, helmet, pendants and many others. However, in Ghana, tanning was done among most ethnic groups in varied forms but the value of the trade was enhanced through the arrival of the Northern Nigerians, they produced beautiful leathers and leather articles such as slippers, sandals, belts, pouches, hats and poufs.

2.4 Tools and Equipment in Leatherwork

The study of the leather industry can never be complete without a look at the tools and equipment used over the years. In Encyclopedia Britannica vol. 15 (1977), it indicated that,

…The earliest tanning tool was flint, used to scrape off flesh. Later, hair and flesh were removed by curved blunt knife over a wooden beam. Leather was shaved to the required thickness with a sharp knife. Such hand tools were improved constantly…

The making of leather had remained a manual job for the skillful craftsman until the invention of leatherwork machines. Machine work is faster and more precise than the handwork. But some people still opt for hand-made goods in the expense of machine manufactured good.

Knives are seen as the oldest tools used in the leather industry. Peterson (1961) explained that, a good knife and a cutting board are all that one really needs for simple leather craft. He further emphasized that; a good working knife must always be kept sharp. The knives used for dehairing are always kept sharp to make scraping easy. Harder (1968) also hold the view that:

… any knives that you use – stencil knife, mat knife, paring knife, skiving knife – should be well sharpened to begin with, and periodically stropped on a knife sharpener, or on a razor strop. A dull knife slows down the work, makes it less enjoyable and tends to produce untidy results…

The beamster uses a dull, curved knife that has a handle at each end to scrape the flesh side of the pelt. The latter is stretched over a board that is curved in the same way as the knife. One end of the pelt-covered board rests on the floor whilst the other end extends to the board towards the beamster for scraping. However, depending on the articles to be produce, a few more tools are available for use.

In view of Harder, (1968), a considerable basic tool useful for leatherwork were outlined. These are;

- Mat knife; or well-sharpened paring knife for cutting all straight edges of the leather with a knife drawn along a metal ruler;
- Stencil knife or linoleum cutter; for cutting within the leather;
- Metal 'T' square, scissors; for cutting curved edges and for laces;
- Lacing chisel, for pounding slits in the leather prior to lacing;
- Tracing wheel; this is handy for marking the edges of leather at uniform intervals for punching;
- Mallet or hammer; for embossing;
- Rotary punch; for making holes of different sizes;
- Soldering iron; for scorching designs into the leather.

The availability of variety of tools gives sufficient room for creative activities and designs for leatherwork to go on.

2.5 Raw Materials for Leather Industry

The leather industry has many materials which are very useful. However, none is of more importance than leather itself. The pelts which are commonly processed into leather come from domestic animals.

The indigenous leather industry depends on the by-product of the meat industries, forming the raw materials needed in this industry. The hides and skins of animals are the sources of leather. The skins of large animals such as cattle, camels and horses are called hides and the skins of small animals such as sheep, goats and pigs are called skins. Animal skin consists of the epidermis, an outer protective layer of the skin covering the dermis. Hides are 1 to 3 square meters in size and weigh about 10 to 20 kilograms. Skins

are smaller in size, 0.4 to 0.5 square meter and lighter in weight around 1 to2 kilograms. Naturally, animal hides and skins have 60 to 70 % of water, which make them prone to bacterial attack, which in turn decays the hides and skins.

The hides and skins gotten from farm animals (cows, sheep, and goats) are the leading common raw materials in the local leather industry. Recently, there has been rise in the production of cattle hides, goatskins and sheepskins in Ghana which shows the availability of raw materials and not running into short supply in a short period. In view of Felsner and Schmel (2002), the availability of raw materials has been touted as a fundamental advantage towards the export of leather and leather products.

However, we can have lions, camels, and buffalo hides being depended on as raw material for the leather industry. In addition, the skin derived from smaller animals such as fishes, dogs and monkeys can also form the raw material the industry needs.

2.5.1 Animal Hides and Skins

The obtainability of hides and skins through the slaughtering of animals is of particular importance to the leather industry (Amakom, 1995). Eboh et al. (2004), hold the assertion that, for many developing countries animal hides and skins are valued exports and they play an essential role in the livelihood of many communities as a source of income and employment prospects.

According Sharphouse (1983, p. 23), the definition of hides and skins is as follows:

"Hide: The outer covering or raw skin of a mature or fully-grown animal of the larger kinds, e.g. cattle and horses.

Skin: The outer covering or raw skin of a mature, fully-grown animal of the smaller kinds, e.g. sheep and goats.

And on confirming these definitions, Boahin (2005, p. 28) also states that:

"Pelt is the general term given to both hide and skin at their raw state. Hide is the name given to pelt or leather obtained from bigger animals such as; cow, elephant, etc. Skin is the pelt or leather obtained from smaller animals such as; sheep, goat, among others."

In Ghana, the pelts which are commonly processed into leather come from domestic animals. The most chief sources are cattle, goats and sheep (Nemile, 2003).

2.5.2 Cowhide

It is the natural, unbleached hide and hair of a cow. Cowhides are natural by-product of the cattle food industry. The middle of the hide or back of the animal is the thickest part of the skin. The sides are some-what thinner and less uniform in thickness. Originally, cowhide retains the grain color of the animal based on the breed of the animal. Cowhide can be painted to resemble skins as zebra, tiger, fish or snake skins, but this is done usually to the lower quality cowhides. It can also be processed into leather, which can be used to make articles like soles, cases, bags and briefcases that must wear well. The most used material in the world by the leather industry is the Bovine hides representing about 2/3 of leather used by the industry.

Plate 2.1: Raw Cow hide

(Source: instrucables.com)

2.5.3 Sheep skins

According to Leach (1995), sheep skins are extensively smaller than cattle hides. It is extremely versatile, soft and supple leather to work with. Sheepskin is hard to model as well. Sheep skins are one of the most common and important sources of raw material for the tanning industry. It is used for cases, handbags and jackets, among other things.

Plate 2.2: Leather from Sheep Skin

(Source: piterest.com)

2.5.4 Goat skin

Tanned leather from goat skin is considered extremely durable and soft hide. Usually, goat skin is obtained in many colours. It has a fine, soft surface but is durable nevertheless. This type of leather is suitable for producing many articles such as purses, cases, gloves and so on. Its natural grain often referred to as morocco grain is sometimes covered with an artificial one. Non-tanned goat skin is used for drumheads, parchment or sounding boards of some musical instruments, like in medieval Europe (mišnice), in India (esraj), in Ireland (bodhrán) and for instrumental drums in Indonesia (bedug).

Plate 2.3: Leather from Goat Skin

(Source: instructibles.com)

2.6 Manufacturing Leather from Hide and Skin

The processing of hides and skins in the production of leathers are practiced all over the world. In many countries today, most of the tanning technologies which were used years ago are still being used. And this is particularly true in the developing countries across the world. But some craftsmen in industrialized countries prefer to use manual approaches to produce leather. With the aim to enable craftsmen to manipulate it to achieve the exact effects they prefer. Leach and Trevor (2009) suggested that, the four dominant producers of well refined completed leathers are Italy, China, India and the Republic of Korea and Two-thirds of the worlds refined leather comes from ten countries. The Encyclopedia Britannica, (1977) has outlined the basic techniques involved in the preparation of leather as follows:

…. (1) Removal of unwanted elements such as hair, flesh and fat, leaving a concentration of high-protein collagen fibers, unstiffened and interspaced with water.

(2) Tanning, that is tanning the hide with an agent, called tannin that takes of the water and then combines to coat the collagen fibres. Tannin raises resistance to heat, hydrolysis and micro-organisms.

(3) Leather finishing is used to gain thickness, moisture, lubrication and physical look. Thus, leather is basically animal skin protein united with tannins, small amounts of oils, dyes, finishes and moisture…

2.6.1 Tanning Hides and Skins

To prevent decay, most tanneries purchase hides and skins that had been cured or preserved. The technique for preserving or curing consists of dehydration without disturbing the skin structure. The common preservation methods are simple air drying which yields bony flint hides; salting which includes treating the hide with a saturated solution (brined); rubbing the flesh side with salt (wet salted); further drying (dry salted) and picking the pelt acid and salt (Encyclopedia Britannica, 1977). The preservation of raw hides and skins in the tannery can be divided into four main stages:

- ✓ Preservation of hides and skins storage
- ✓ Beam house operations
- ✓ Tanning operations
- ✓ Post-tanning and finishing operations

Depending on the raw materials available for the activities in the tannery, there can be a variation in the stages listed above and the final desired products expected.

After hides or skins are received in the tanneries the first operation performed on them is beaming. This is done to remove dirt, salt and some soluble proteins.

2.6.2 Tanning Processes

Tanning is termed as the procedure of transforming raw hides and skins into leather. The processes are classified into three categories. Leach and Trevor (2009), proposed pre-tanning, tanning and post-tanning as the tanning processes of hides and skins. The Encyclopedia Britannica, (1977) outlined some indigenous technologies involved in the preparation of leather as follows:

1. *Unwanted impurities such as hair, flesh and fat were removed excluding high-protein collagen fiber with water.*
2. *Tannin increases resistance to heat, hydrolysis (decomposition caused by water), and micro-organisms.*
3. *Leather finishing is used to achieve desired thickness, moisture, lubrication and physical beauty.*

2.6.3 Pre-Tanning Operations

In Sharphouse (1983, p. 20), he indicated that: *Fresh hides or skins contain water, protein, fatty materials and some mineral salts. Of these, the most vital for leather-making is protein. This protein may contain of many types. The key ones are collagen which, on tanning, gives leather and keratin, which is the chief constituent of hair, wool, horn and the epidermal structures.*

Usually fresh animal hides/skins consist of 65 % water and proteins and fat 30-35 %. Looking at the high measure of dampness in the hide/skin, there will be bacterial deterioration. In order to keep this bacterial movement on check, the dampness substance should be brought down below 30%. The typical normal salt (i.e., Sodium Chloride) is applied to the hide/skins so as to dry it out. It loses weight to the tune of 30-45%.

Sorting by size, weight, or quality is carried out among the raw hides and skins. Some parts of the raw hide and skins (including legs, tails and heads, and so on) can be cut off. Normally, the cutting is done in the abattoir, yet it can likewise be done in tanneries.

2.6.3.1 Curing and Storing

With whatever reason, raw hides and skins can't be prepared instantly ("green"), it must be cured first. The procedure that keeps the disintegration of skins and hides from the initial are flayed in the abattoir until the procedures in the beam house start is termed as curing. Curing is done in the abattoir, at the hide market, or at the tannery. Salting and drying are prominent routines for long haul conservation. In some cases, cooling, utilizing smashed ice or refrigerated storage, and biocides are techniques for safeguarding (2-5 days) hides and skins. Depending upon the strategy for curing picked, hides and skins are by and large put away on beds in ventilated or aerated and cooled territories for storage.

2.6.3.2 Soaking

Generally, the next process applied to skins and hides after flaying and curing them is soaking. In view of Boahin (2005, p. 20), “soaking” of skin or hide is “the practice where a hide or skin is immersed into water in a pit to remove the salt used for preserving the pelt, and the removal of blood and other unwanted nitrogenous matters soluble in water”. The fundamental reason for this procedure is to evacuate the salt utilized during curing, re-hydrating the material and to dispose of undesirable materials, for example, dung, blood, soil and so on. On the “process of soaking” Sharphouse (1983, p. 80) also stated that: “The first process entails the immersion of skins in water which seeks allow them to re-absorb any water which may have been lost after flaying. And again, Boahin (2005, p. 79) laid emphasis on how “washing and soaking” can be achieved in a variety of ways. He stated that:

Skins may be stacked in revolving drums filled with water. The water removes dirt and blood, washes out most of the salt, and replaces moisture lost in the curing process. Washing and soaking of pelts may also be done by immersing them in ordinary water filled in pits or vessels sunk ground floor level with capacity of holding sufficient litres for water for the purpose.

The length of time of soaking may run for a few hours to a couple of days. In soaking added substances like surfactants, enzyme preparations and bactericides can be utilized to help protect the pelt in many ways contingent upon the kind of raw materials utilized. The soaking processes can be categorized into three phases. These are:

1. **Dirt soaking:** To eliminate or evacuate the undesirable materials in hides and skin through dirt soaking, 300-400 % of water is utilized to achieve such purpose.
2. **Main Soaking:** In this operation, water, non-anionic wetting agent (0.2 % concentrated soda ash (0.2% concentrated) and additives (0.0 5% focus) are utilized. The motivation behind Main Soaking is to re-hydrate the material.
3. **Last soaking:** As part of this operation only water is utilized for the washing reason since major part of salt connected with the safeguarding of skin/hide up is evacuated during the soaking operation.

These processes if carried out well with caution are obvious to provide the tanner with good and quality skins or hides for making the type of leathers needed for the market.

2.6.3.3 Liming

In liming two processes are mostly done alongside each other. These are:

1. Dehairing – this is the application of Lime (8-10 %) along with Sodium Sulphide (3%) to the skin to remove hair.

2. Re-liming – lime, soda ash, caustic soda and so on are applied to the skin being processed to open up fibrous structure. This causes the pH of the skin to rise to 12-12.5.

In relation to *"unhairing or dehairing and liming"* Sharphouse (1983) and Boahin (2005, p. 21) briefly defines them. Sharphouse suggested that: "Unhairing or dehairing is the process of removing the hair from the grain side of the leather after it had been loosened through chemical reaction for 1-10 days". And Boahin also further explains that the ordinary technique practiced consists of immersing the goods in a mixture of lime or lemon juice and water for varying periods. Boahin (2005, p. 81) concludes by stating that: "During the process of immersion, the pelts are periodically stirred for easy penetration of the chemical used". The reason for this process is to encourage the exclusion of hair, tissue, fat, inter-fibrillary protein and to open-up the fibrous structure for osmotic swelling.

2.6.3.4 Fleshing

According Sharphouse (1983) there are two main types of fleshing. It is either fleshing by machine or by hand. Sharphouse (1983, p.114) briefly explains the two different processes: "Hand fleshing is done by placing the hide or skin, flesh up, on a beam and removing the unwanted flesh, connective tissue and fat by a skillful slicing and pushing action with a two-handed knife". On machine fleshing, Sharphouse stated that: "The cutting fleshing cylinder of the fleshing machine has sharp, square-ground blades, arranged in an opposed double-helical form to spread the skin flat as it cuts". Boahin (2005, p. 21) further defines "fleshing" as: "The removal of fat and fleshy matters from the underside of the skin either by hand using flesher's knife over the flasher's beam or by machine". The fleshing by hand method is mostly practiced in the indigenous tanneries since the knife is easy to come by unlike the machine which also seems to work

faster than the manual type. It is believed that fleshing by machine produces materials of better quality than the manual fleshing since sometimes the double handled knife used by the local tanners are blunt and rusted which promotes scratches, dirt and poor uniformity in the skins and hides.

2.6.3.5 De-liming

Deliming normally involves the washing of the skins or hides with clean cold water. Generally, it is the clearing of excess lime from the skins or hides. Boahin (2005, p. 21) comments briefly on the *deliming* process by stating that:

After the hair and debris has been washed from the skin, hides are delimed in a vat of acid. After the lime has been taken from the skin, hides are treated with enzymes, which smooth the grain of the leather and help to make the resulting product soft and flexible.

This is a procedure to change the pH from 12-12.5 to the middle of 8-8.5 keeping in mind the end goal to improve the enzymatic action, which changes over a proteins' percentage into solvent structures. Sharphouse (1983) recommended that, delimed skins must be processed in the next stage. With the reason that, as the alkali has been washed, the decaying bacteria can survive once again, causing a slimy feel and giving loose leather with damaged structure.

2.6.3.6 Pickling

The procedure of adjusting the pH suitable to the tanning operation and to anticipate inflammation of the leather is termed as pickling. To confirm this, Sarkar (2005) suggested that, Pickling is usually performed in a bath of salt and acid to neutralize the residual lime and set the right pH requisite for tanning. This procedure deals with the application of water (80%), salts (8-10%), formic acid (0.28-0.3%) and Sulphuric acid (0.75 – 2% in light of thickness) to the hides or skins.

A pH in the middle of 4 and 4.5 is looked after a while if vegetable tanning is to occur; pH in the middle of 2.5 and 7.3 is kept up if there should be an occurrence of chrome tanning.

2.6.4 Tanning Operation

These are a set of operations aimed at converting the pelt into leather. Tanning is carried out for the following reasons:

1. To stabilize the collagen fibres of the skin or hide to temperature.
2. To stabilize collagen fibres to prevent putrefaction of the raw material.
3. To introducing the properties required in the end product (Sharphouse, 1995).
4. To prepare the material as basis for other chemicals during further treatments.

The tanning procedure is of two types. These are Chrome (mineral) tanning and vegetable tanning. In chrome tanning, Basic Chromium Sulphate [Cr2 (SO4) 3] (7-10%) containing 25% Cr2O3 and Sodium Sulphate (25-30%) is utilized. The pH expands to 3.8-4.0 toward the end of the chrome tanning procedure which is called pacification.

For vegetable tanning, plant extracts are utilized. In this tanning procedure, the pH tumbles down from 4-4.5 to 3-3.5.

2.6.5 Post-Tanning Operation

For leather to serve its purpose, after tanning it becomes stiff and rough and it must be carefully worked on. Post-tanning operations are usually carried out after the tanning process to induce additional properties desired in the leather to make it more applicable for the intended utility. In view of Sharphouse (1995) and Boahin (2005), the requisite processes performed to give a final touch to the leather to improve its aptness for its intended purpose is termed as finishing. The finishing processes involve many skills. Normally, this begins with shaving: where leathers are shaved on the flesh side to remove

any small bits of flesh left that might be clinging on the leather. In situations where the leather is very thick 'shaving' may be followed by 'splitting'; where a razor-sharp knife is used to split it into two. Afterwards, the leather is scoured by hand until the grain surface is thoroughly cleansed from bloom and excess tannin. 'Grain' is the upper thickness and 'flesh split' is the lower thickness.

'Fat-liquoring' where leather is treated with oils or grease to make it flexible and strong becomes the next process. Removing excessive stretch from the leather so that it will maintain its shape when wet, where one edge is pulled is done by the act of 'staking' in the finishing stage. The wet leather is clamped or pasted on boards, and then allowed to dry and this is called 'tacking'. Dying is the next stage for finishing but the choice of dye depends on the tanner and it involves so many approaches. The dyeing process is achieved by the methods of brushing: dyeing or 'staining', Clipping, Dyeing in paddle or drum and Spraying (Encyclopedia Britannica, 1971).

Landmann (2003) and Sarkar (2005) hold the view that, through finishing activities extra properties such as softness, flexibility, water resistance, abrasive resistance, grain correction and aesthetic appeal can be upgraded to make the leathers much more useful. Using appropriate finishing processes improves leather's value, suitability, durability and market penetrative ability (Sharphouse, 1995). In furtherance, Guthrie-Strachan (Leather Science Lecture Notes, 2008, BSLT, UK) suggested that, finishing aims at enhancing appearance and introducing desirable properties – these two major functions become possible in shoe upper, upholstery and garment leather through the application of category of finishing chemicals such as resins, protein binders, fillers, handle modifiers and auxiliaries (cross linkers). Depending on the grain quality, the resulting leather may be full grain for aniline or semi aniline or corrected grain (pigmented).

2.7 Concept of Defects in Leatherwork

Defects in leatherwork basically refers to flaws and errors identified or associated with leather that renders such leathers inappropriate for production artefacts of certain purpose. These flaws or discontinuities on leather surfaces that associated with factors such as human errors, pest and disease attacks and inappropriate tannery practices. This has drawn to the fact that defects in leather begins from pre-slaughter, slaughter and post-slaughter stages and to the products in a large extent (Habib et al., 2015).

2.7.1 Defects Associated with Hides and Skins and Leather

Normally, defects occur on natural leather surfaces and they cannot be removed during processing. According to Barlee et al., (1999), the problems that influence leather quality starts when the animal is still alive, and these include,

1. Cuts caused from barbed wired, in-fighting between male members and thorn scratches and cuts;
2. Brand marks made by using hot iron on the animal skin.
3. Holes and spots from infections and infestations, produced by ticks, horn flies, among others.
4. Abscesses resulting from wrong vaccination techniques and natural growth marks or excess weight related problems, like furrows and wrinkles.

The animal skin may suffer severe wounds from nails and wood splints in the truck during transportation. Before tanning, three significant procedures such as bleeding, skinning and curing happens can also cause leather defect. Improper skinning techniques may cause flaying cuts that may turn unusable otherwise valuable parts of the leather, while insufficient bleeding can cause vain marks.

Sharphouse (1995) holds the view that probably no other damages occurring in tannery practice cause as much confusion and concern as those diseases and defects native to the

skin or hide on the stock as it is received at the tannery although others develop in the preparation of hides and skins at the tannery. He further explains that these defects mar the otherwise beautiful leather, and recognizing the various causes and defect types is important to prevent the avoidable ones. In the view of Sharphouse (1995), defects which may occur on raw hides and skins and also devalue their intentions for tanning include the following: abscess, blind warble hole, brand mark, dung damage, eczema, hump sore, lice, pox marks, ring worm, fat wrinkles, badly bled skin, badly shaped head and shanks, cut throat, flay cut (scar mark), grain break (grain burst) and holes, discoloration (red heat), vainness as well as sun blisters.

Based on the shape and size of affected area of the skins and hides, Yeh et al. (2001) classified the defects as follows:

1. Thin spots: hair root, pinhole, putrid spot, dermatitis;
2. Circular spots: thorn scratch, nail mark, chrome stain, slat stain, cured stain, putrefied;
3. Thin line: vein, wring felt mark;
4. Strips: score knife, neck wrinkle;
5. Holes: dig damage, grub hole, bullet mark;
6. Patterns: brand mark; and
7. Irregulars: wart, contamination, pipe grain, flay mark, putrefied, scratch, chafe mark, gear mark, parasitic speckled (tick, mange), dung stain.

Generally, defects associated with skins and hides go beyond reflecting in the eventual leather produced, to the extent of sabotaging the quality of artefacts produced from the leather, hence limiting market potentials. On confirmation, De Haas (1925) suggested that defects limit the utility and overall economic validity of skins and hides as the core

raw material in leather making. In furtherance, De Haas lamented that any blemish associated with the material deducts an amount of value and reduces the potentials of the material.

2.7.1 Classification of Hides and Skins Defects

A considerable number of researchers such as Wilson (1923), De Haas (1965), Thorstensen (1976), Bienkiewicz (1983), Sharphouse (1995), Sarkar (2005) and Husen, et al. (2016) has suggested that defects found with pelts stem from two main causal reasons: during and after the death of the animal. Leach (2002) also believes that defects are generally classified as ante-mortem, and post-mortem defects. The ante-mortem damages include cockle (*ekek*), which is as a result of an allergic skin reaction to parasitic infestation, grain scratches, branding, age (shrinkage) and poor substance (thickness of the skin or hide, toughness of the fibres and the closeness of the texture of the fibres). The main slaughter defects are flay cuts (scores), holes (a complete perforation of the skin or hide resulting from a knife or flaying appliance), poor pattern, and vein marks (traces of blood vessels in the skin where the blood was not completely drained). Post-slaughter defects include heating or decay, hide beetle damage, machine damage and grain crack (ESGPIP 2009). In addition, Yacob (2013) also holds the view that skins and hides defects are categorized into two main groups. First group being those created or acquired during the life of the animal (Pre-mortem defects) and second group being those that occur during and after slaughtering of animals (Post-mortem defects).

Common skin blemishes can be considered as: regular causes; damages due to external parasites and disease; pre-slaughter/ante-mortem defects involving human activities; and post mortem/post slaughter blemishes such as improper flaying and skin cuts/gouges. These natural damages include breed/type, sex/age, nutrition and climate. The defects

due to external parasites and disease include parasites and other diseases (Infections) like ring worm, streptothricosis , demodex, dermatophilosis and pox.

Due to the regard of skins and hides as a traded international commodity, the International Standards Organization has provided the following references for the description of defects as stated by (Asubonteng 2010).

1. ISO 2822 –1:1998 –Descriptions of skin defects (cattle)
2. ISO4683 –1:1998 –Raw sheep skins –Descriptions of skin defects
3. ISO7482 –1:1998 –Raw goat skins –Descriptions of skin defects

2.7.2 Effect of Abattoir Practices on Hides and Skins

Several defects in the skin leading to reduction in quality are acquired at the place of slaughter (Heidemann, 1993, Gerhard, 1996, and Sarkar, 2005). In actual fact, priority is given to the meat than the skin since the leather industry depends on the meat industry for survival. According to Sharphouse (1995), the value of the corpse, is often ten times the value of the hide or skin, and this ratio manages the degree of care given in flaying to the hide and to the carcass.

In SLTC Pocket Book (1999), it was explained that, on slaughtering the main focus is on bleeding, poor bleeding results in blood clotting in the skin vessels and leads to accelerated microbial putrefaction. The slaughter should be rapid and efficient to avoid attack from micro-organisms. In addition, the slaughter center should ensure that the animal is in a clean, dung-free, healthy condition to avoid attack from micro-organisms.

The local butcher serves as the most direct means of obtaining hides and skins needed for leather manufacturing. However, it is this same place that skins and hides, due to various reasons, may lose their economic qualities for leather manufacturing. Actions such as not toeing an accepted pattern of ripping the skin before flaying affects the shape

of a skin formed. Obviously, bad pattern affects the usage of the leather produced and reduces the market value of finished product.

2.7.3 Flaying of Hides and Skins

According to ISO2822 description of defects, poor flaying may lead to defects such as gouge marks, holes, cuts, scratches, scores, poor trimming and bad shaping of the skin. In Sharphouse (1983, p. 6), he briefly defines flaying as: "The process of removing the skin from the animal". Flaying is the first step applied in the processes used in leather manufacture. Sharphouse further explains that flaying is normally carried out by the butcher and the methods used generally give first priority to producing a good quality carcass if the animal is to be eaten.

Kite and Thomson. (2006) holds the assertion that, removal of pelts or flaying technology is impeccable since hide or skin is known for its further uncountable applications; outstanding among them is converting it into leather by the tanning process which raises the economic value of the pelt enormously and creates a chain of employment for several people.

Flaying is much easier while the carcass is warm and since heat is lost rapidly the chances of putrefaction is reduced (Sharphouse, 1995). The premium objective of skinning is to remove the animal's pelt efficiently, neatly, and with less damage or none to either the hides or fur. Expertise is prerequisite to flaying since any damage caused tarnishes the quality status of the material. For the first time, one is almost certain to damage the hide by slicing too close or else by cutting too cautiously and leaving large chunks of flesh that will mean extra work during the fleshing operation to skin an animal perfectly requires experience. This makes it possible for full utility and enhances further applications including leather making, drumheads, lashings, saddles, knife handles, sandals and snowshoe thongs.

2.7.4 Defects on Indigenous Leather

In the leather industry quality is reflected in the 'grade' of output. A grade roughly indicates the fitness of a leather for a specific use. Grades are defined in terms of the presence or absence of certain types of defects on the leather. Defects may occur on tanned leather due to the following reasons;

- Damage to the raw skin before tanning
- Poor storage
- Improper processing during manufacturing

According to Kassa, (1998) many hides and skins processed at tanneries have various degrees of defects and are inappropriate for export reasons these damages happen in the pre-slaughter stage of production while the animals are alive. Mostly, big areas of these blemishes are directly related to parasitic skin diseases and secondary self-inflicted damages (Ermias, 2000; Haffeze, 2001). However, influences posed by post-slaughter blemishes linked poor management and treatments of skins after slaughter are also important and cannot be overlooked. Base on the estimates from Ethiopian tanneries at certain times of the year, as high as 50-60% numbers of skins are rejected due to defects (Stosic, 1997).

Scratches are part of the most common mechanical defects associated with both hides and skins in our part of Africa. The reason has been that most animals are found in areas of open savannah grasslands or areas with fairly dry environment. Naturally, Scratches render leather esthetically unattractive and also causes a considerable loss of tear strength particularly on skins. The quality is reduced and the cost of processing is increase as tanners try to conceal the errors on the grains by embossing or printing. As animal husbandry practices in our part of the world discourage dehorning, **horn rakes** on hides

is a common problem among cattle. These hide injuries normally occur mostly in fights, during transportation or crushes.

The practice of branding is common because farmers use prominent branding in order to identify their animals. However, as ticks are important vectors of tick-borne diseases, the attack by ticks on livestock does not only exhibit defects to hides and skins but also spread livestock diseases. These parasites stick themselves on the body of their host in attempt to feed on their blood. Ticks causes tick marks on hides and skin. They gradually destroy skin in areas where they feed mostly making the area inflamed and sometimes allow parasite attack e.g. screw-worms and various microbes.

Loss of quality of hides and skins due to ante-mortem undertakings is therefore very core to the leather industry and has contributed extensively to the decline of raw materials of African origin. Salting or frame drying as preservation methods are not practice entirely by farmers, collectors and traders of hides and skins, resulting in hides and skins suffering from hair slips, mold and bacterial attacks.

Bacterial damage is sometimes not an indication of decay and loss of hair in some areas and an unpleasant smell. If hides are allowed to get wet in the process of shipping or in transit, it gives room for decomposition and such exposure can results in varying degrees of damage, the worst being direct contact with seawater and iron decks, the resulting iron salt stains being permanent and a serious loss to the tanner.

The penalties of all these damages are that every tannery (or trader) had to develop tailored standards to select/sort quality of incoming raw hides/skins and outgoing finished leather ultimately resulting in price differences among grades (Hagos et al., 2013).

2.7.5 Downgrading the Value of Leathers Due to Defects

The Leather industry depends solely on leather for its survival, as the name depicts, and the outer cover of the animal (skin and hide) serves as the only source of raw material for leather manufacturing, therefore, the existence and availability of animals serve as the lifeline of the Leather industry. In most instances, the animal skin is a by-product of the meat industry; in its absence there is nothing like Leatherwork. This lays emphasis on the integral role animal husbandry plays in the production of quality Leathers in the leather industry. Therefore, policies and emphasis laid on quality animal husbandry practices are of major interest to the leather industry. The general welfare of animals therefore becomes a major consideration in the area of total quality Leather production. At the end, the prevention of faults and defects on animal skins and hides is the major concern of the leather industry.

However, "In most tanneries 'sorting' is also carried out at later stages where faults become more apparent, e.g. after hair and flesh removal, pickling, tannage, drying, etc. and on the finished leather" as well (Sharphouse 1983, p.27). This is done because any one of the damages mentioned in earlier parts of this section is unwanted in a leather product and effort is needed to prevent them, either by skin selection, selective cutting of fault free parts of the leather, or processing techniques to cover or minimize the faulty areas. Sharphouse (1983, p. 26) further concluded that:

The importance of a hide or skin depends on the value of the leather that can be made from it.

Fundamentally, defects lead to reduced net output (defective parts have to be trimmed out) of the raw material as well as reduced price as the hide or skin can't be used in full where it might fit best, instead it may be used for secondary purposes. Poor quality also increases cost of processing thereby reduce the competitiveness of the product for export or for production of value-added products at home.

2.8 Controlling Defects in Leather

Controlling as defined by World Web dictionary is the activity of managing or exerting entire constraint over something. In other words, the ability to subdue an action to overcome a problem totally. Controlling defects in leather based on the understanding is the ability of finding means to manage or curb the occurrence of defects on the surface of leathers. Since it is an established fact that defects relating to leather can render it less useful or totally useless, it however considered a success if the user is able to redeem these defected leathers for their intended purposes. (Project Fair, n.d.). Different defect control is usually based on the type of flaw associated with the leather towards adopting appropriate methods such as concealing by colour, Surface texturing or trimming which are measures to manage surface defects.

2.8.1 Concealing Defects on Leather

Recently, due to technological advancement most top grain leather is partly or fully corrected. These hides retain the quality, thickness, strength and supple feel of their top grain, but arrive at tanneries with many flaws. Some hides are sanded to remove undesired markings and then embossed with a consistent grain pattern while others are gently buffed to even out the grain. Many levels of corrected leathers exist, from slightly to heavily altered depending on the state of the leather. Normally, partly corrected hides look and feel more natural than fully corrected hides.

2.8.2 Dying as a Method of Concealing Leather Defect

According to Pervaiz *et al.*, (2016), "the historical signs of dyeing materials were found in the Indus Valley Civilization at Mohenjo-daro and Harappa ruins". In the early life of men, people used natural dyes to paint caves, decorating shells, coloring feathers, hides and celebrating religious festivals. Based on the report of Archaeologists, the Egyptian mummies were covered in dyed clothes using Carthamus Tinctorius dye. In furtherance,

dyeing materials were also found by excavation at archaeological sites where ancient fabrics were extracted. In view of Savvidis *et al.* (2013), it is affirmed that the use of natural dye "saffron" is also mentioned in the Holy Book of Christians "Bible".

According to the Encyclopedia Britannica (1971), the dyeing process is accomplished by the following Methods, (1) Brush: dyeing or 'staining', (2) Clipping, (3) Dyeing in paddle or drum, (4) Spraying. In addition, Burkin shaw and Paraskevas (2011) suggested that, the techniques for dyeing tanned leather are using tanning drum, spray and brush. It is believed that dyeing with these techniques only produces one color without motive, and then, the motive depends on the original leather. To produce various motives on the surface of tanned leather and with various colors, Batik Method dyeing is used compared to general tanned leather dying method. The wet-end dyes requirements are as follows:

- Consistence for reproducible production batches;
- Quality to meet the required colour specification;
- Flexibility to apply to various types of leather;
- Economical cost of dyes.

Leathers are dyed to impart colour as demanded by the fashion and to correct some minor defects that exist on their surfaces. The dyes used in leather can be categorized as:

- Basic dyes
- Direct dyes
- Acid dyes
- Reactive dyes
- Metal complex dyes

Acid, direct and metal complex dyes are the most commonly used ones. Sometimes for darker shades as blacks and some browns, basic dyes are normally used. However, reactive dyes are seldom used in leather processing.

Leather has structural imbalances and flaws. This makes it a hard substrate to dye. To Booth (1988) he asserted that, adequate experience is needed to have an in-depth understanding of the dyeing properties. Covington *et al.*, (2005) indicated that, to bring together dyes of diverse structures, for example, the usual acid with direct dyes or 1:2-metal complex dyes, can lead to difficulties in attaining levelness and shade consistency. To achieve an even shade, the selection of uniformly tanned leather and suitable dyes are essential (Heidemann, 1993).

2.8.2.1 Tie-Dyeing

It is a way of making patterns of colour by folding, tying, stitching, crumpling, or otherwise preparing the fabric or leather to prevent the flow of the dye into the folds of the fabric or leather. It is seen as a great option to revamp or change the looks of an existing leather piece. The final design of the fabric or leather is determined by the pattern of the folds and where the colours are squirted. The end results can be anticipated and controlled to some extent with an experience in tie-dye.

Plate 2.5: Tie-Dye Leather shopping bag

Source: pinterest.com (2018)

2.8.2.2 Marbling

It is a simplified process that creates patterns which are looping, organic, and pretty. Hard substances such as glass, metal, or plastic cannot soak up colour. Marbling can be done on only absorbent materials like cloth, paper, leather or wood. It is believed that leather works quite well for marbling, even though the colours may come out a bit muted because of the natural colour of the leather.

In marbling any kind of fabric, paper, leather, or wood surfaces, a “size” (thick cellulose type solution) is created for the paint your working with to float on, somewhat like oil on water. The floating paints are swirled into patterns. And the design is captured by laying

a treated piece of fabric or leather down on top of the paint to transfer the swirls to the fabric or leather.

Plate 2.4: Marbled leather boot

Source: pinterest.com (2018)

2.8.2.3 Sprinkling

It is a super fun dyeing technique that creates a cool speckled effect on the fabric or leather. On using the right tool one can literally “sprinkle” the dye onto a prepared fabric or leather and get an excellent design, where each and every piece is one of a kind. In sprinkle dyeing you can use one premixed colour at a time, and on doing so you can see individual colour granules in the design which appears like you have used several different colours. Tools such as paint brush, spoon and etc. can be used to swirl the dye after sprinkling to create endless designs.

2.8.3 Printing

It is a way of introducing a new and exciting process of decorating leather and concealing leather defects as well. Printing is a way of putting images on leathers such that the image

bonds permanently to the leather, forming part of it. This will retain the natural beauty and the feel of leather with added benefit of full colour image on top of it. This procedure allows manufacturers and designers to produce leather artefacts with regular, durable graphics on any leather, be that raw hide, crust, coated, dyed and everything in between them.

A prerequisite for printing on leather is that, a pigmented smooth leather is used, since a transparent top coat is applied in the process to prevent paint abrasion, sealing the ink layer. In order not to reduce the ink adhesion, the leather must not have any release agents on the surface. The basic tone of the leather to be printed should be very bright, so as not to falsify the colour character of the motif.

Plate 2.6: Printed Leather

Source: pinterest.co.uk (2018)

2.8.3 Market Potential of Leather with Concealed Defects

Generally, any industrial activity should begin with appropriate market survey and demand analysis to learn about its present and future market potential for the product.

Leather manufacturing activities do not stop at the manufacturing stage. Gaining a positive market of the product with relatively good income for the manufacturer and satisfaction of the customers is the utmost goal of all leather producers.

With great increase in civilization and technology development, diverse leather types have been manufactured. Currently, leather has formed large use in leather goods industries with footwear industry remaining the most patronized.

With the young generation being very fashion conscious, especially the demand for footwear and leather goods is increasingly high. Due to the poor workmanship and low quality of these units of footwear and leather, goods manufactured locally have failed to make an influence on the local market to the level anticipated. Most of the footwear & leather goods in the market are produced in places like Europe and developed countries. Normally, these articles are expensive and it is evident from the current market that the people pay higher price for high quality fashionable articles. Locally, if these articles can be produced for the market, their price can reduce considerably and these local articles will gain popularity.

2.9 Leather Articles

In Ghana, customary tanners who use unscientific, delayed soaking methods and old-fashioned surface treatment solution deliver leather which is regularly of poor quality in nature. However, Amakom (1995) suggested that the nature of completed leather dependably relies on the way the animals were raised, flayed, and the sort of tanning procedure used.

Interest in leather has expanded since end employments of leather have been changing significantly throughout the hundreds of years, and the industry has needed to surrender and utilizes many times in the course of the most recent 1,000 years or more. Footwear

is a more essentially patronized product, around 65 % of leather went into footwear, yet this extent has been diminishing of late toward 55 %. In recent times, there has been development in leather upholstery and other leather items and leather has gained new and creative employments. Since 1990, the vehicles upholstery part has been uncommonly solid.

"Leather articles" covers a wide variety of items, such as, a wide range of bags, attaché cases, baggage and other travel merchandise, little things (e.g., wallets, purses), belts, and so on, including other leather items, for example, upholstery and clothing. From the time of horse and foot transport to the vehicles period, from the utilization of leather items for particular practical purposes to the present business sector of extravagance products, the leather business industry has a history with exceptionally unmistakable movements in end uses and materials. A lot of leather products have been and are still made in little craft/art shops.

During the last three decades, the leather industry has experienced real changes because of special elements such as: significant advancement in procedure innovation, development in efficiency, the advancement of expectations for everyday comforts and work costs in many nations that create leather products, the increase in showcasing and brand procedures at national and global level, mostly because of new publicizing instruments (e.g., TV and radio advertising), the advancement of the vehicle industry, the separating of activities through generation outsourcing and exchange of ability of developing nations, and the improvement of air travel and tourism across the continents.

2.10 Common Leather Articles Classification/Categorization

Industrial hides and skins are currently created in such little volumes that they fit with materials in a small-scale corner and are hard to classify. However, they ought not to be overlooked.

2.10.1 Small Leather Goods

The elegance and quality of leather product identified with electronic hardware is a fragment that is required and expected to develop. In the last ten years, there has been an improvement in the leather industry in relation to the use of leather in designing of holsters for cell telephones, MP3 players, and iPods. Pocket leather products, which are chiefly made of genuine leather, take after societal patterns trends and uses, for example different sizes of phone covers.

2.10.2 Handbags

Generally, handbags serve as a helpful adornment. In some societies they are an indication of social status. It can be concluded that the utilization of handbags is much impacted by society and fashion, which themselves differ starting with one nation then onto the next. There are wide assortment of designs and styles with numerous values or price in this business sector. The market sector for bags retailing has been developing quickly in the previous years due to its great fashion. Hence, a considerable amount of income has been generated by individuals who are actively involved in this business.

2.10.3 Briefcases and Portfolios

These articles are basically produced using superior textiles and engineered materials, for example laptop bags and office bags. Recently, portable PCs (laptops) have made an incredible requirement for cases with a particular design which are made from leather. Additionally, ladies' and men's portfolios made of real leather and synthetic textiles hold a vital spot in the market sector. This commercial sector is connected to travel and business since changes in travel are influencing this sector in the same path as they travel products of such nature across continents.

2.10.4 Cat and Dog Articles

A large number of these items, for example collars, chains, gags are made dominantly in developing nations. In industrialized nations such as Europe, USA and the UK there is a quick developing market sector for such goods. This is all because individuals are progressively attached to pets.

2.10.5 School Articles

Previously, various better-known brands were military packs. Today, there are several articles used by students of various stages and of different forms which are made from leather. Germany and France in the 1980's changed the existing trend and pattern and introduced a new and popular fashionable lines of school bags packs with some made from leather. Currently, the Trends and Patterns is the rucksack made of canvas and design printed with different logos and brand names.

2.10.6 Watch Strap

It is of different quality and texture. Skins for watch straps must be hostile to anti-allergic and to have great levels of water resistance. The assembling methods, as on account of belts, is profoundly mechanize, with the exception of top extravagance items (hand-sewed straps made of exotic skins). To form a fashion pattern, those products are continually developed as indicated by buyer needs and, for specific items.

2.10.7 Belts

It is one of the commonly used leather articles among men and women. Since changes happen for the most part in buckle designs, belts are very little affected by fashionable style. Particularly in the conventional men's belts section it is an unfaltering and moderately vast market. Hence, individuals in this business are raking a considerable amount of income base on its popular use among the population.

2.10.8 Military Equipment

Historically, as far as seats, water storage, harness, belting, holsters, footwear, and at one time armour covering are concern among the military, leather have been of awesome significance to them. Presently, items such as footwear and gloves are typically made of very specialized hides to be used as individual defensive hardware for the military.in the last decade, this is a certain specific marketing sector, which has been developed extensively by many developed countries.

2.11 Theoretical foundation of the study

Imitationalism Theory

Imitationalism theory applies to artworks that appears realistic. These artworks contain identifiable, realistic looking articles and scenes that closely emulate what is seen in the real world. The main objective of imitationalist art is to represent the subject matter as realistically as possible (Welka, 2016). According to Artopium (2015), imitationalism can also be said to be an aesthetic theory of art which places enphasis on the literal qaulity and that a work is said to achieve its purpose if it looks like what is seen in the real world.

CHAPTER THREE

METHODOLOGY

3.1 Overview

This chapter deals with the methodology of the study. This includes the research design, research methods, research tools, population and sampling, research experiments, data collection, analyses plan and description of the processes followed in processing the raw material. Research design as affirmed by Gimblett (2006) as the general method that the researcher chooses to incorporate the components of the study in a coherent and logical way, thereby, certifying effectively and address the research problem; it adds up to the plan for the collection, measurement, and analysis of data.

3.2 RESEARCH BASIS

3.2 .1 Qualitative Research Method

DeFranzo (2011) explains Qualitative Research as primarily exploratory research and it is used to achieve meaning of underlying reasons, opinions, and motivations. It gives an in-depth understanding to develop ideas or hypotheses for potential quantitative research. Qualitative Research is also used to reveal thought and opinions, and expand problem. This research method was employed to find out defects associated with locally produced indigenous tanned leather, secondly, identified methods employed by users of locally produced indigenous tanned leather in managing leather surface defects with regard to their strength and weakness.

3.2.2 Descriptive Research Design

Descriptive research design aims at describing "what exists" by answering questions such as "what is", "what was", "why" and "how" of a situation with respect to variables or conditions in the situation. According to Shuttleworth (2008), it is the best method for collecting information that will demonstrate relationships and describe situation as they

exist. Shuttleworth also explains descriptive research design as a scientific procedure which involves critical observation and description of behaviour of a subject without impacting on it in any way. The descriptive method was employed to describe the processes followed chronologically to execute the experiments conducted towards the concealing of defects on the indigenous Ghanaian tanned leather surfaces and also made it convenient for the study to report various defects affecting surfaces of locally produced vegetable tanned leather and richly explained methods employed by vegetable tanned local leather users in managing leather surface defects.

3.2.3 Experimental Research Design

Experimental research design is a chronological and scientific method to research in which the researcher controls one or more variables, and controls and measures any change in other variables (Blakstad, 2008). The Experimental Method makes it possible to determine whether changes in the independent variable causes subsequent changes in the dependent variable (Zen, n.d). The main weakness of the experimental method is their dependence on what many see as an "artificial" environment. The experimental method was chosen to explore the various techniques that were employed to conceal defects on locally tanned leather and to improve the economic value of these leathers. The leathers were taking through some (painting, printing, dyeing, spraying etc.) to determine which technique will be more suitable in concealing the defects on the indigenous Ghanaian leather surfaces and the ranging effect on the various articles produced from these leathers.

3.3 Population for the Study

This is the totality of elements upon which the study was based. Population, also known as research population is a well-defined collection of individuals or objects that are the focus of a scientific query (study) and have similar characteristics (Wilson, 2009)

therefore, the researcher identified the following population for the benefit of the research; Leather experts from Kwame Nkrumah University of Science and Technology Leather Department, indigenous leather tanners at Aboabo in the Asokore Mampong municipal Assembly, Leather Artisans in Central Market and Indigenous Leather traders.

3.3.1 Target Population

Target population refers to the entire group of individuals or objects to which the researcher is interested in generalizing their conclusions (Wilson, 2009). The target population for the study is focused on 134 individuals consisting of leather experts, leather artisans, leather tanners and indigenous leather trading shops in the Kumasi Metropolis. The researcher also focuses on ante-mortem and post-mortem defects comprising of hole defects, colour defects and surface texture defects. Table 3.1 is a representation of the targeted population for the study.

Target Population	**Number of population**
Leather Experts	10
Indigenous leather tanners at Aboabo community	27
Leather Artisans	52
Indigenous leather traders in Kumasi central market	45
Total	**134**

Table3.1: Target population for the study

Target Population for Leather defects
Surface texture defects
Colour defects
Hole defects

Table 3.2: population for defects

3.3.2 Accessible Population

Accessible population according to Castillo (2009), accessible population is the subset of the target population which forms the population from which primary data is gathered. In this research the accessible population comprises the total number of individuals in the respected field that have been accessed, these are: 7 Leather experts, 14 Local Leather tanners, 26 leather artisans and 15 indigenous leather traders in Kumasi Metropolis.

Target Population	Number of population
Leather Experts	7
Indigenous leather tanners at Aboabo community	14
Leather Artisans	26
Indigenous leather traders in Kumasi Metropolis	15
Total	**62**

Table 3.4: Accessible population for the study

3.4 Sampling Technique

Sampling is a research technique that seeks to select a part of the population to represent the whole". It involves selecting a unit from a population of interest so that results gathered from the selected unit can be generalized for population from which units were chosen from (Trochim, 2006). In this case, 40 locally produced Leathers from Aboabo

were selected to represent Areas for leather production, 26 leather Artisans from Central market and Asafo respectively and 4 consumers of leather products.

3.4.1 Non-probability Sampling

This technique has no way of assuring that each member of the population will be represented in the sample. The non-probability sampling used include:

I. Purposive Sampling

As the name infers, items or samples used in this regard is selected based on purpose that it may represent varied angles of issues, Therefore, the researcher's decision to Purposive sampling was used to deliberately identify leathers with associated defects such as insect bites, pale surfaces, flay cuts and patch defects towards concealing them.

3.5 Data Collection Instruments

Data collection instruments are conventions, applicable procedures or tools that help gather and measure information on variables of interest in an established systematic fashion enabling researchers to answer research questions, test hypotheses or evaluate outcomes. The main purpose in conducting a qualitative research is to collect and generate data that answers the research questions. Leedy and Ormrod (2005), are of the view that researchers normally make use of multiple forms of data in any single study through observation, interview, objects, written documents, audiovisual materials, electronic documents (e-mail, websites). However, in this study, the main data collection instruments for the research were observation and interview.

3.5.1 Observation

Observation refers to the systematic analysis of real-time processes and operations with the goal of identifying needs or challenges or improving processes and practices of all that can be seen. Observations typically incorporate a prescribed protocol containing specific measures of observable behaviour and the narrative recording of

the program activities and their context (IAR, 2011). From the aforementioned, the researcher participated directly in the survey carried out in relation to defect types and categorization it that respect and also how local leather craftsmen manage such defects in producing leather artefacts. This gave the researcher the opportunity to make direct observation and objectively record information from respondents for the benefit of the research.

3.5.2 Interview

This refers to a one-on-one directed conversation with an individual using a series of set questions designed to elicit extended responses. Interviews allow participants to express their thoughts using their own words and organization; thus, they are particularly valuable for gaining insight (IAR, 2011). The researcher in this quest to draw in-depth understanding in interviewed leather experts on factors contributing to defect occurrences on skin and hides. Interview was also conducted for local leather craftsmen on artefact production and how defects are managed in the production of products. This was coupled with the unstructured interview and the open-ended question types were asked respectively. According to Cohen and crabtree(2006) unstructured interview is where questions asked to gain understanding into a particular field of research does not follow a structured interview guide or a type where questions asked are not prearranged in the sense that, the researcher may seek to discover real sense of person's understanding of a situation and increase validity of information. Also, Farrel (2016) looked at open-ended questions as questions designed to encourage respondents to give a free-form answer with no restrictions. This method allows a full meaningful answer using the subject's own knowledge and or feelings.

3.6 Sources of Data

Sources of data refers to a collection of resources and origin of information that are specific to planning a related research; thus, helping researcher's effort to develop from quite substantial levels to more efficient ones (Parker, 2003). Hence, researcher's categorization of data sources into two main types; the primary and secondary data sources.

3.7 Data Collection for Objective One

To identify and classify surface defects on locally tanned leathers and leather artefacts

The purpose of this objective is to identify surface defects on locally tanned leathers and leather artefacts. In achieving the set objective, 40 pieces of locally produced leather with surface defects were selected and collected from indigenous local tanners at Aboabo community. This was based on the two categories thus Ante-mortem and post-mortem defects respectively. The researcher employed direct observation and purposive sampling technique in identifying leather based on colour, these are cream leather, coffee leather, red leather and black leather. The same approach was also employed coupled with writing as a means of documenting to help keep accurate record of selected defected leather(s). After selection of defects, further classification into three categories were observed that is: surface texture defects, colour defects and Holes. In order to determine the exact defect, the human sense of touch and sight were used, this as explained by Bradford (2017) is the sensations communicated to the brain through specialized neurons in the skin and also the ability to persieve things through the eyes respectively. The defected leathers were observed in two classifications thus Ante-mortem defects and Post-mortem defects.The defect categories as identified by the researcher helped to consider concealing methods and strategies to be adapted to address the issue of the study.

3.8 Data Collection for Objective Two

To explore the various colouring techniques to conceal defects on the indigenous tanned leather surfaces.

The purpose of the set objective is to explore the various colouring techniques to conceal defects on indigenous tanned leather surfaces hence embarking on activities that help exhibit possible techniques to conceal the defects. The experiment process was based on five experimental processes as shown in table 3.5.

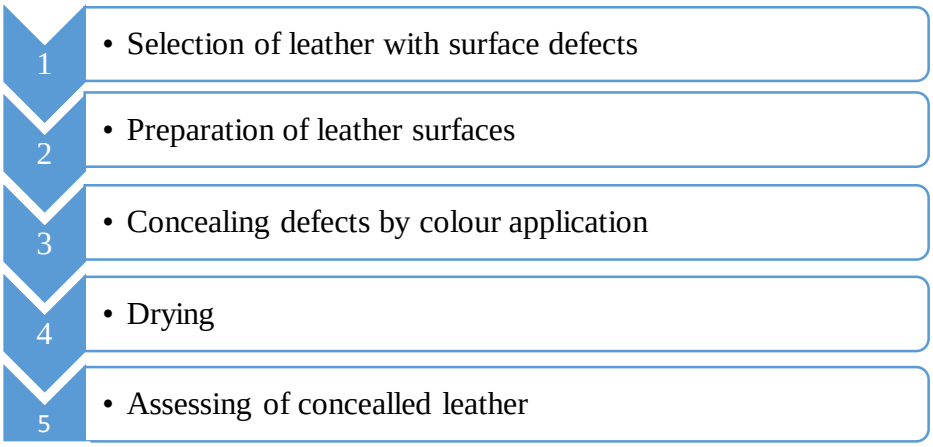


Table 3.5: The experiment process

3.8.1 Activity One: Selection of Leather with Surface Defects

Leather as a natural material with its variety of visual appearances nonhomogeneous in colour, thickness, brightness, wrinkleless, and etc. is a complex object for control and analysis. The researcher in pursuing this quest visited leather experts at KNUST, leather traders at Kumasi Central Market and Aboabo, leather tanners at Aboabo, and leather artisans at Kumasi central market to investigate various leather defects that are common on the local market. The defects selected were from two leather categories having with four colour types that is cream leather, black leather, red leather and coffee leather. Table 3.6 presents leather categories with defects

Table 3.7: Types of defected leathers acquired with picture identification

Colour defects	
Pale surface 	Stains 
Surface texture defects	
Scratches 	Insect bite 
Hole defects	
Burns 	Flay Cuts 

3.8.2 Activity two: Preparation of leather surfaces

This activity dealt mainly with the secondary treatments needed to help Ghanaian indigenous tanned leather attain necessary softness as well as prevent bad odor emanating from leather due to the excess flesh left on the surface of the leather. The following were the activities for the preparation of leather.

Sanding: this activity was done to aid in the removal of excess flesh from the fleshy side of the leather with the use of sand paper. The sanding activity was embarked on to render all leather to be used for the experiment pliable since the main aim of sanding leather is to further remove unwanted or excess flesh on the surface of the leather.

Plate 3.1: Sanding the flesh side to remove excess flesh.

Soaking/washing: to reduce the bad odor from the leather, it was deemed expedient to soak the sanded leather in clean water for five minutes also known as complete immersion to allow or give room for easy rinsing of the prior to stretching.

Plate 3.2: Soaking of sanded leather prior to sanding.

Stretching: this process is aimed at facilitating the drying of the leather and getting it flat or straight for easy usage.

Plate 3.3: Stretching of soaked leather on board

3.8.3 Activity 3: Concealing defects by mode of colour application

Having identified various defects on the indigenous tanned leather surfaces as demanded by objective one of this research, there is the need to explore various colouring techniques to conceal the identified defects on the leather surfaces. The researcher carried out several experiments through the application of various colouring techniques such as marbling, tie-dyeing, dubbing, printing and spraying on selected leathers with defects on their surfaces to evaluate the effectiveness of concealing indigenous leather surface defects with these colouring techniques.

1. Concealing by Dyeing method

Marbling in leather is simply the application or the adding of colour to leather to enhance its aesthetic appeal through a controlled or uncontrolled experiment that allows vat dye on leather to flow freely and be absorbed in order to achieve designs on the surface of the leather whiles tie dye method is a pure controlled experiment where parts of the leather tied using a rope to create resist points on the leather and soaked in a dye bath to absorb colour. This experiment was undertaken on all the leathers identified under the three categories namely: Surface texture, Colour defect and Holes to determine methods that best conceals defects on leather. The following activities in this regard are: soaking in water and pounding the leather to attain relative softness and allow or open up pores of the leather to accept the dye.

Plate 3.4: Preparation of leather for the dye application

The next stage of the marbling process is folding and or picking of leather to depict design to be attained on the surface. This is done by laying soaked leather on a working table to facilitate easy folding and picking as required by the researcher.

Plate 3.5: Picking leather for marbling technique

Plate 3.6: Folding and tying of leather prior to dying

After preparation of the leather by tying and picking, appropriate dye is mixed and applied on the leathers by means of soaking and pouring respectively. The components of the dye mixture are sodium hydro oxide, caustic soda and vat dye.

Plate 3.7: dyes being applied to leathers.

The final stage of the dye application process is the washing and exposure to light. The washing process is basically to get rid of excess dyes on the surface of the leather and its exposure to light helps in oxidation and the fixing of the dye on the leather.

2. Screen Printing Method

Screen printing is defined as the process or a technique whereby a mesh is used to transfer ink onto a substrate except in areas made impermeable to the ink by a blocking stencil. This method of colour application on the defected leather was applied on specific leathers namely: scratches, insect bites, stains and pale surface, holes.

The first stage of the screen-printing process is getting the leather surface flat in order to felicitate the printing process which includes soaking and stretching on a flat board to dry. After the drying process, the leather is placed on a printing board for printing. The materials and tools needed for this experiment are: screen, acrylic paste, masking tape, clean water for washing of screen after printing and squeegee.

The next stage of the experiment is checking and blocking areas of the screen for pin holes and blocking them with the masking tape. This is done at the edges of the screen to prevent bleeding of paste on the leather before fixing the developed screen on the defected leather. The final stage of the printing is the pouring of paste and printing. This requires a consistent energy exertion on the squeegee to help in printing neat and even distribution of the printing paste on the leather.

Plate3.8: Printing on defected leather with acrylic paste

3. Spraying method

This experiment is conducted to ascertain the possibility of concealing defects on local indigenous tanned leather by the use of spraying technique. This process involves the use of chemically combined colour that can adhere on to surface of leather using a designed lace to serve as a design template for this process. A stretched defected leather is laid on a flat board to serve as support for easy spraying and the lace is then laid over the leather and pinned to secure event and prevent shifting in the spraying process.

Plate3.9: stretching and pinning a lace on the surface of leather for spraying

The next stage after laying the leather and fixing of lace is the spraying process. In the quest to achieve good effect and smooth spraying, constant level of chemical application is required to achieve best of results and this is done under clear weather condition to facilitate easy adhering of chemical on leather and the drying process

Plate 3.10: Lace been placed on leather and sprayed

3.9 Data Collection for Objective Three

To produce articles using the concealed indigenous tanned leathers.

The purpose of this objective is to produce articles using the concealed defected leathers in order to affirm the fact that the leather can serve the purpose for which it was originally made for and further enhance the products. In achieving the third objective, categories of leather artefact were considered that is foot wear, upholstery products, decorative products and container products due to their usage or the public having to use most artefacts under each category stated.

i. Technical Illustrations

Technical illustration is basically the use of drawing to visually depict methods, measurements and communicate the final view of the artefact. The process involves the use of two-dimensional (2-D) illustrations, three-dimensional (3-D) illustration, tools and materials and actual artefact production.

Two-Dimensional (2-D) Illustrations of artefacts for production

Figure 3.1: technical illustration of shopping bag

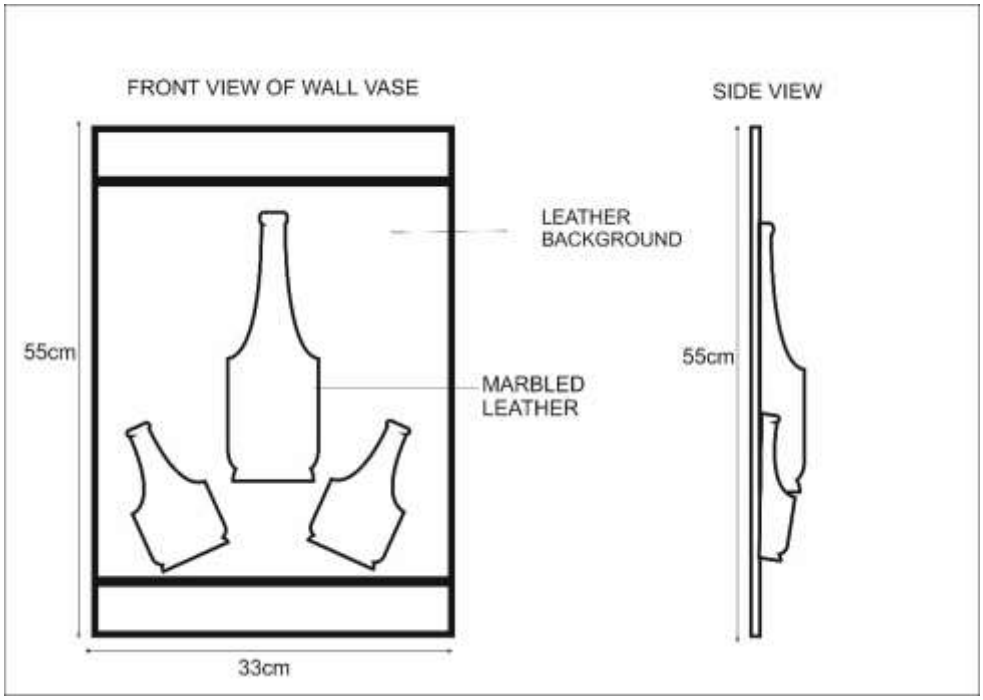


Figure 3.2: Front and side view of wall vase

ii. General Working Procedure

This section deals with the systematic processes that were followed in the execution of the project. The study employed concealed locally tanned leather

and some non-conventional material such as leatherette and adhesives as a means of achieving set objective thus forming and finishing of the works. Several activities aided in achieving the set objective and was followed as such;

3.10 PRACTICAL EXECUTION OF THE WORK

3.10.1 Tools and Materials

Pencil and pen: used for marking and writing dimensions.

Brush: used for application of glue or adhesive on leather and lining to joining.

Ruler: used for taking and transferring measurement onto materials.

Cutter: used for cutting leather and straw board into required shapes and sizes.

Needle and thread: used with the thread to aid in stitching designs on to works.

Glue: used for joining leather together. Serves as the binder.

Leather: used as the main material in which the artefacts are executed.

Straw board: used as a reinforcement material to give it strength and maintain its shape.

Leatherette: used for lining artefacts.

Punch set: used to create holes in leather for easy stitching.

Scissors: used for cutting leather and leatherette.

Pinking shears: also, used for cutting leather with orderly zigzag effect at the ends.

Magnetic press stud: used as a fastener for bags to prevent easy opening.

3.10.2 Project 1: Production shopping Bag

1. Template drawing and cutting out

This stage is the first which has to do with drawing of templates and cutting towards the transferring to the leather. The drawn templates were transferred onto leather with specified dimensions with respect to size and design then cut out. Assembling

of part with the use of adhesive and decoration of bag was undertaken to ensure consistence accuracy in the parts of the finished product.

Plate 3.11: cutting of template after drawing

2. Transfer and cutting of leather to shapes and sizes

The cut templates were then placed on the leather and then traced in order to transfer and maintain the exact measurement, they were then cut using scissors.

Plate 3.12: template tracing and cutting prior to assembling

3. Assembling of Parts and Designing

This stage of production includes the assembling of parts of the bag and designing, the researcher employed the thonging technique where holes were created and stitched with thongs to form the design created.

Plate 3.13: joining the parts with tape to create room for stitching.

Plate3.14: stitching with thongs together

Plate 3.15: Joining the base and the handle

4. Joining and Finishing of Product

This is the final stage of the production where the assembled parts are then joined together to form the entire bag, the researcher used glue as binder and reinforced by thonging them.

Plate 3.16: Fixing of base to the bag

Plate 3.17: Display of finished bag

3.10.3 Project 2: Production of Wall Vase

The second project begins with moulding of vases by laying leather on wooden mould and picked to attain required shape.

Plate 3.18: Leather being laid on mould to attain shape

After moulding the vases, they are left to dry and careful hardening was done with the use of carpenter's glue or polyvinyl acetate and sand as binding agent. This when dried renders the vases hard hence help maintain its shape. After hardening the vases, the background is prepared for the mounting of the vases onto the background.

Plate 3.19: Applying glue prior to sand application

Plate 3.20: Tracing and cutting of outlet in frame for mounting

Plate 3.21: Fixing leather and preparing the surface as background

Plate 3.22: Punching and stitching of the vases on the background.

Plate 3.23: Spraying of the wall vase to enhance its aesthetic

Plate 3.24: Display of final artefact

3.10.4 Project 3: Production of Footwear

1. Template Drawing and Cutting out

The initial stages of the foot wear production stage where designs are made and selected from prior to its transfer on required leather for usage. The designs or patterns were drawn with the help of a shoe last, masking tape and a drawing tool (pen or pencil). The patterns are now cut out which are then transferred onto a card board to form the main template for the shoe.

2. Transfer and cutting of leather to shapes and sizes

At this stage of the process, the templates as cut according to dimensions are then traced on the leather(s) and cut out prior to assembling and decoration. The parts are then skived at the edges to reduce the bulkiness at the joints of the shoe when sewing.

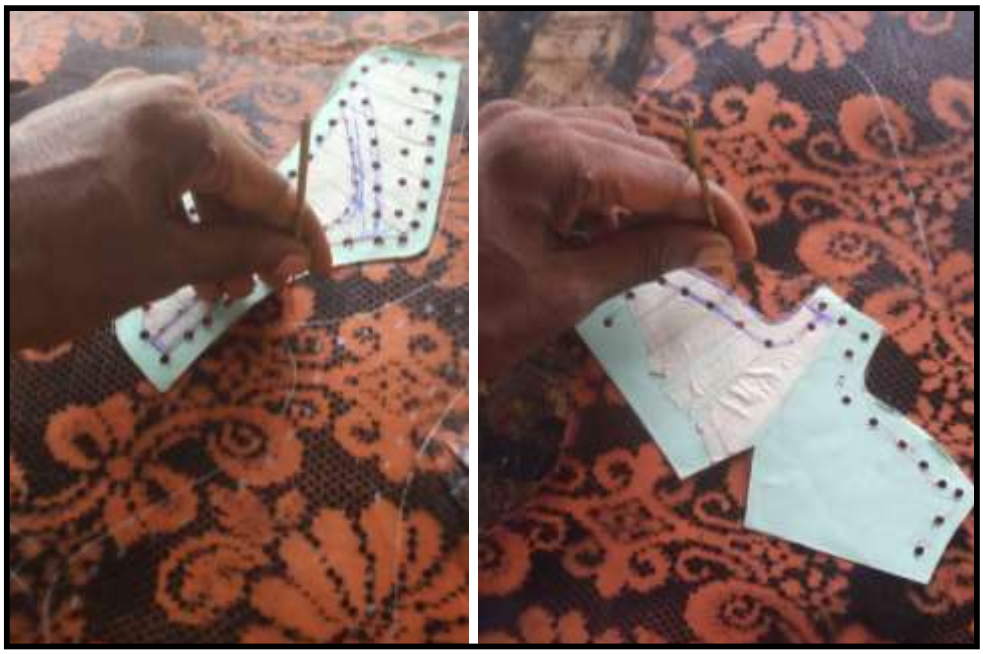


Plate 3.25: tracing of template on leather for cutting

Plate3.26: Skiving the edges of the parts with a cutter

3. Assembling parts and designing

The parts after skiving were the glued at the edges and sewn with the help of a sewing machine. At this stage, designs relating to stitching or sewing are all executed here.

Plate 3.27: Sewing of designs and parts together.

The base of the footwear is also created as part of the footwear production process since it comes in three parts (uppers, insole and base sole). It basically followed the laid down sequence of base production where templates are drawn and cut, transfer

onto base material and cut out, fixing of shoe hills, and finally assembling the upper and the base.

Plate 3.28: Tracing and cutting of base

4. Joining and finishing of product

This is the final stage of the footwear production w

ere the uppers are fixed or attached to the base with the use of glue. Prior to the fixing, the base is prepared by tracing template of the required base on the base material and cut out with the use of cutter.

Plate 3.28: Application of glue to the base and upper prior to attachment

The final part of the footwear process is the lasting which involves the merging of the base and the uppers together to complete the forming process.

Plate 3.29: shoe placed under pressing machine

Plate 3.30: final pictures of the footwear

CHAPTER FOUR

PRESENTATION AND DISCUSSION OF FINDINGS

4.1 Overview

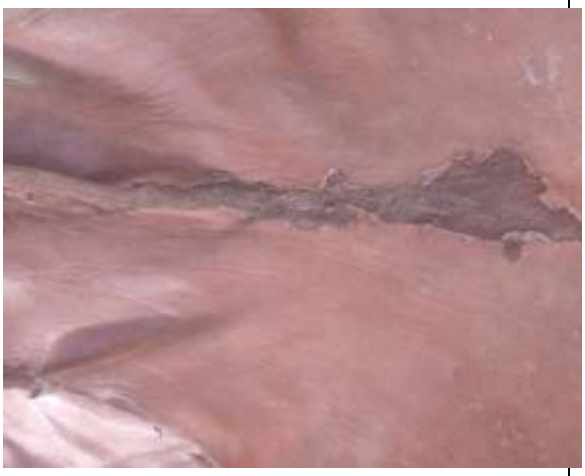
This chapter is the presentation of analysis of data gathered from primary and secondary source. To facilitate the analysis, and also establish superior implications of the data in relation to the research problem and set objectives, charts and tables have been used to synthesise the data into a logical organisational structure.

4.2 Presentation and Discussion of Results for Research Question One

What are the existing defects on the surfaces of locally tanned leather and leather artefacts?

The objective of this research question was to identify surface defects of local indigenous tanned leather by observing and analysing critically the type and cause of defect associated with them. In the quest to know defected leathers, it was observed that there are many types of surface defects under the two selected category that is ante-mortem and post-mortem. Leathers with surface defects were selected and collected from indigenous local tanners at Aboabo community for the purpose of answering the research question one. In achieving results for the 40 pieces of leathers selected, five (5) defects were identified and categorized as ante-mortem with which each leather identified was recorded respectively. Insect bites recorded 6, grain peeling recorded 2, wrinkles recorded 2, scars recorded 3 and grain breaks recorded 2 respectively which equalled 15 leathers representing 37 percent of the total population of leathers selected. Seven leathers also categorized as post-mortem defects. Stains recorded 6, scratches recorded 6, holes recorded 3, hair remains recorded 2, stitch patches recorded 2, mold defects recorded 2 and uneven dyeing recorded 4 respectively which also equals 25 leathers, representing 63 percent of the

total population of the leather for the study. Table 4.1 and 4.2, represents defects associated with ante-mortem and post-mortem process.

Type of defect	**Number of leathers identified**
Insect bite 	6
Grain peeling 	2

Wrinkle marks 	2
Scars 	3
Grain breaks 	2
TOTAL	**15**

Table 4.1: Ante-mortem defects categories

The total representation of defected leather as identified under ante-mortem defects in the table 4.1 was out of a result of critical observation and analysis. Out of the five identified defects in this category, six (6) leathers were noted to have insect bite as the most dominating defect under ante-mortem leather defects indicating that this defect is the commonest caused by animals being exposed to insect prone areas without proper or no disinfection steps to keep the animals healthy and free from such attacks. It was also noticed that these insect bites as identified cover virtually the entire surface of leathers. The second defect analysed was scars which recorded three (3) as the second dominating number under ante-mortem defects. This is also an indication of improper animal husbandry system employed by animal or livestock keeper especially those who produce for the harvest of the skin in order to produce good surface quality of animals when used for leather. Grain peeling, grain breaks and wrinkles have two (2) leathers identified respectively. These defects have their cause emanating from the malnutrition which could result from excessive or unbalanced diet or inability to absorb foods. Most often, wrinkles on animal skins or leathers is caused by slaughtering female animals that have got their bellies expanded out of the pregnancies. From the established facts, it was identified that the most common ante-mortem defects in indigenous tanned leathers in Aboabo are insect bites and scars hence, experimenting on these two.

Type of defect	Number of Leathers identified
Stains 	6
Scratch marks 	6
Hole 	3

Hair remains 	2
Stitch patches 	2
Uneven dyeing 	4

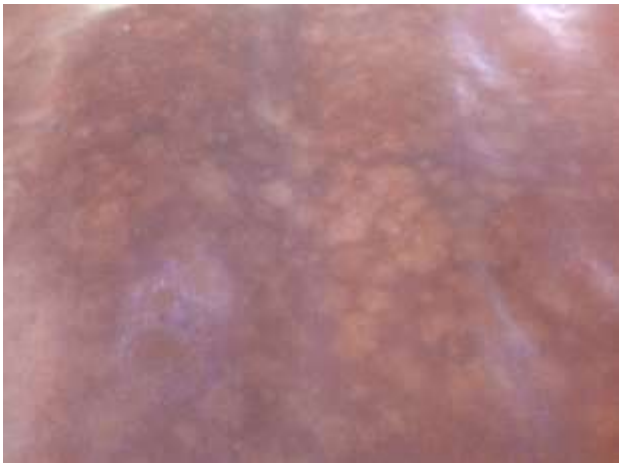
Mold defects 	2
TOTAL	**25**

Table 4.2: Post-mortem defect categories

Post-mortem defects as established are surface inconsistencies on leathers that occur after the death of animals. The total results obtained under post-mortem defects represented in table 4.2 recorded a total of 25 leathers out of 40 pieces selected. Stains recorded six (6) leathers. This kind of defect is caused by urine and dung or dropping from animals or also known as unclean livestock husbandry in area where leathers are produced. The improper handling of these leathers leads to them being placed on such unwanted materials that will at the end cause discrepancy on the surface of the leather, scratch marks also recorded (6) as caused by human factor during process of slaughtering and after slaughter stages of the animal. This defect is mostly caused by dragging the carcass of the animal on the ground. Holes recorded three (3) leather pieces, this defect are mainly obtained in leather during the flaying, dehairing and defleshing process where knife and blunt knife are used as a means of removing hair and flesh form the surface of pelt. The improper way results in cuts and holes generation in the leather. Hair remains also recorded two (2). This defect is as a result of improper removal of hair from the surface of the skin during the dehairing process and this causes the use of such leather to fulfil tasks or projects partially or not at all in order to prevent inconsistency. Stitch

patched recorded two (2), this are caused as a result of deliberate attempt to join flay cuts. Uneven dyeing recorded four (4) pieces of leathers. This can be referred to as patchy effects that appear on surface of leather after its dye process to cover or coat the surface of the leather and mold also recorded two (2) leathers with such defects in them mold defects are fungi attacks on the surface of leathers due to exposure to moisture, these defects mostly remain on the surface for a long period of time especially after a long infestation. With the above-mentioned results, it was identified that the most dominating hence the commonest post-mortem defects to be associated with indigenous tanned leather in Ghana are stains, and scratch marks with uneven dyeing and holes respectively.

4.3 Presentation and Discussion of Results for Research Question Two

What colouring techniques can be harnessed by local tanners for concealing defects of leather surfaces?

The objective of this research question seeks to explore the various colouring techniques to conceal defects on the indigenous tanned leather surfaces. The researcher in this regard identified three major methods by which leather can be conceal and used efficiently, these are as follows:

4.3.1 Dyeing (tie-dye and marbling)

This method is well explained as way of enhancing the surface appearance of leather by introducing dye through immersing and marbling. The immersing method involves the total submergence of the leather into a dye bath. This solution is prepared out of mixing vat dye and warm water in addition to sodium hydrosulphite (hydrous) and sodium hydroxide (caustic soda) as the main additives in the ratio 3:3:1. This ratio is highly recommended for use of leathers to be dyed since. The function of caustic soda and hydrous in dye bath is to ensure colour fastness and brightness.

The marbling method is described as an uncontrolled way of dye leather where soaked in clean water, beaten in mortar to open the fibers and soften the leather. Gentle gathering of the leather is done to ensure free flow of colour or dye on the leather. The dye mixture is then poured evenly on the leather and left for 10 to 15 minutes during which oxidation takes place. After the stipulated time frame, the leather is then taken and rinsed to remove excess dye form the surface of the leather and then stretched to dry. This method is believed to be most effective since it is able to conceal several surface defects such as stains, insect bites, grain peelings, hair remains, wrinkles and surface scratches.

Plate 4.1 a and b: Displays tie and dyed leather and marbled leather

(Source: Author's field work)

4.3.2 Screen Printing

This method is the application of colour on the surface of leather with the help of a screen where print paste is forced through the mesh of the screen to register exactly as designed or represented on the screen. screen printing is able to manage stains and surface scratches just like the painting method. Screen printing unlike painting is less time consuming especially in cases where the same design is to be used for a lot of leathers.

Plate 4.2: Screen printed leathers

(Source: Author's field work)

4.3.3 Spraying

This method is described as covering the surface of defected leather with laced fabric and sprayed for the patterns or designs in the lace to be printed on the leather. Before spraying, the leather is sanded and stretched to ensure smooth and flat surface. This method due to its uniqueness can be able to help conceal or manage defects such as stains on leather surfaces, pale defects and also surface defects such as scratches and minor insect bites.

Plate 4.3: sprayed leather

(Source: Author's field work)

Some other methods adopted by local leather craftsmen to manage defected leathers

A. Painting

This is the method of applying paint with brush on surface of leather in a deliberate attempt to manage surface defects associated with such leathers. Defects such as minor cuts, insect bites and stains are easily concealed by local leather craftsmen in contributing greatly to adding value and improving on the aesthetic appearance of the leather and the products made of them.

B. Polishing

This is the application of polish in a wax or liquid form to coat the surface of leather in order to enrich or enhance their aesthetic appearance and also to manage surface defects associated with the leather.

Scorching

Scorching is the art of inscribing or making impressions on surface of leather by applying hot metals and the surface of the leather to create variety of tones known as light and shade. The intention of these lights and shades is to create decorations on the surface of leather in a quest to manage surface defects.

Stamping

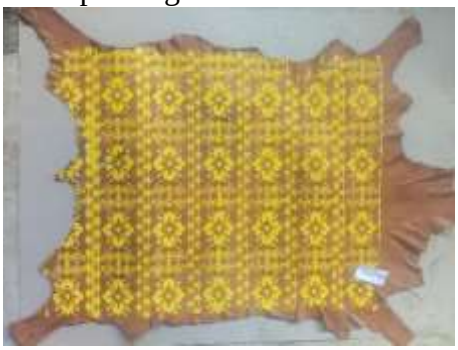
This is the use of pressing tools to create impressions on leather surfaces. Tools in the form of metal rods with motifs are mostly used as stamps for this purpose.

BEFORE CONCEALING	AFTER CONCEALING
Colour defects	
pale surface 	
Stains 	After marbled 
Stains before spraying 	After spraying 
Surface defects	

TABLE 4.3: Representation of Ante-Mortem and Post-Mortem Defects After Concealing

4.4 Presentation and Discussion of research question three

What kind of articles can the concealed indigenous tanned leather be used in producing?

Scratches before marbled 	After marbled 
Scratches before printing 	After printing 
Insect bites before marbling 	After marbling 
Insect bite before printing 	After printing 
Holes	

Flay cuts before printing	After printing
	

The objective of this research question is to produce articles using the concealed indigenous tanned leathers. In the quest to address the issues associated with the kinds of artefacts to be produced, the researcher looked at three categories of artefacts namely; Containers, Clothing and decorative artefacts for the purposes of production and establishing the fact that concealed leather can be effectively and efficiently used for artefact production.

Containers: these are products that come different forms, sizes and also colours meant for various purposes. Some of these purposes are; for carrying loads and personal belongings. Types of containers are bags, shopping bags, water bottles, clutch bags, files and wallets.

Clothing: this category includes al articles that are worn or used on the human body as adornment. These articles include bracelets, necklaces and footwear (shoes, slippers, sandals)

Decoration: this as established by Boahin (2008) is the act or process of using leather as a decorating material which may include artefacts in a form of using natural decorative leathers and furs at their natural state to create a specific to serve and beautify rooms. Articles such as wall clocks, chandelier, arm rest, picture frames etc.

CHAPTER FIVE
SUMMARY, CONCLUSION AND RECOMMENDATION

5.1 Overview

This chapter being the final part of the thesis deals with the summary of the project work, challenges encountered by the researcher during the project, conclusions and recommended solutions suggested by the researcher during the study.

5.2 Summary

The research aimed at concealing defects on Ghanaian indigenous leather surface using colouring measures. the objectives were:

1. To identify and classify surface defects on locally tanned leathers and leather artefacts.
2. To explore the various colouring techniques to conceal defects on the indigenous tanned leather surfaces.
3. To produce articles using the concealed indigenous tanned leathers.

The research established major findings on the topic ‘conceal the defects on the surfaces of the Ghanaian indigenous leather in leather production’ basing on the set research questions.

5.3 Main Finding

1. The research question which aimed at identifying existing defects on the surfaces of locally tanned leather and leather artefacts, the researcher employed the use of observational data collection instrument to help determine and categorize leathers with peculiar defects. surface defects associated with local tanned indigenous leathers are; Flay cuts, Scars, Wrinkles, Pale or Uneven dyeing, Scratches, Mold defects, Stain, and patched leathers were identified respectively as the main defects on these leathers. These defects were grouped into two categories based on the time of their occurrence that is Anti-mortem or Post-mortem defect and its causative factor being either natural cause or human cause.

2. The objective which two sought to explore the various colouring techniques to conceal defects on the indigenous tanned leather surfaces, the re searcher identified the following;
3. With regards to the screen printing, less time was consumed especially when printing the same design on more than one leather (mass production) but not all defects can be covered in this same situation since each defected leather has a unique pattern.
4. It was also identified that hole defects could not be concealed using any of the dyeing methods (marbling and tie-dye) because the holes where first patched using leather pieces with adhesives as binder hence its complete immersion in the dye bath causes the leather piece to remove since the glue used in fixing it becomes weak.
5. It was also observed that using the print method for concealing defects such as scratches, minor insect bites and pale surface is most appropriate since this method covers and merges with the defects on the leather surfaces seemingly well.
6. The third objective seek sought produce articles using the concealed indigenous tanned leathers and it was observed that the concealed leathers used for the artefacts were able to conceal well and show no sign of defect affecting leathers used.

5.4 Conclusion

The research findings achieved in the study informed the following conclusions

1. Locally produced vegetable tanned leathers are associated with various leather surface defects which reduce the aesthetic appearance and the quality of leathers. The drain in vegetable tanned leather and its products' aesthetic appearance by leather surface defects have resulted in the downgrading and rejection of the leather by most leather users.
2. Despite the numerous surface defects identified in locally tanned vegetable leather, some local craftsmen have been able to come out with alternatives such as painting,

stamping, scorching and polishing in managing defects in some of these leathers. Also, Anaesthetic appearances by leather surface defects is as a result of improper caring for animal skin during their Anti mortem and post mortem periods.

3. It is possible to conceal defected leathers to revive them in the use for artifact production towards introducing meeting local and international market at large since the concealed leathers have been able to produce artefacts effectively and efficiently. Also, the use of colour in concealing defects in local indigenous tanned leather has been successful since the leathers applied on have exhibited interesting aesthetic appeals.

5.5 Recommendations

1. Local leather tanners are encouraged to adopt proper mechanisms that will reduce defect on indigenous tanned leather surfaces during leather production.
2. Leather artisans and students who uses indigenous tanned leather for their articles can adopt leather defect concealing techniques as discussed in this study.
3. Seminars and workshops should be organized to introduce and teach local leather craftsmen and students these techniques to increase its use.
4. A further research should be conducted on other techniques used by local Ghanaian leather craftsmen to help build capacity in the creation of awareness towards reviving the face of the leather industry in Ghana.

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APPENDICES

Appendix A

Interview Guide for Leather Experts

1. Do you use indigenous tanned leather for your products?

2. How are defects associated with surface defects?

3. What are some of the defects you often come across?

4. Do you dispose such leathers or manage them?

5. How do you manage them?

6. What are the strength of the managing process?

7. What are the weaknesses of the managing process?

Appendix B

Interview Guide for Leather Tanners at Aboabo

1. How do you manage surface defects?

2. What are the causes of defects on leather surfaces?

3. How is the market value for local leathers?