

**GHANAIAN INDIGENOUS VEGETABLE TANNED LEATHER, A
POTENTIAL MATERIAL FOR MARQUETRY**

By

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(B.A. INTEGRATED RURAL ART AND INDUSTRY)

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DECLARATION

I hereby declare that this submission is my own study towards a Master of Philosophy in Integrated Art (Leather Technology) and that, to the best of my knowledge, it contains no material previously published by another person nor material which has been accepted for the award of any degree of the University, except where due acknowledgment has been made in the text.

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21/09/2015

M.N.

DEDICATION

This work is dedicated to my entire family, friends and all Leatherworkers in Ghana

ABSTRACT

The purpose of the study was to use Ghanaian indigenous vegetable tanned leather as a potential material for marquetry. The term marquetry is derived from a French word “Marqueterie” meaning inlaid work. It is a technique in furniture making where the grain patterns and the colours of wood veneer are used to create pictures. Wood veneers are well known in the world as common material used for marquetry, other materials such as metals, straw, horn, shells and mother of pearls are also used, and hence these materials have common characteristics for marquetry work. The need to embark on developing strategies to boost the national economy, and at the same time to add value to the Ghanaian Indigenous Vegetable Tanned Leather; a local material very versatile and easily obtainable can serve as a potential material for marquetry since its properties and characteristics are enormous. This material is manipulated for diverse uses such as body items, upholstery, household items, containers, sports items and entertainment items. Ghanaian furniture manufactured can tap into this technique in their field of endeavour to bring innovation and creativity. The researcher employed qualitative research using the descriptive and experimental methods; the descriptive method was used to describe the procedures and processes of constructing marquetry with Ghanaian indigenous vegetable tanned leather. The purposive sampling was used to select the sample size. The researcher used interview guide and observation as data collection instruments for the study. In the light of this, the researcher observed that the Ghanaian wood workers and sellers are acquainted with the technical use of wood veneer, besides most customers have also been exposed to the use of wood veneer products. This project will enable leather technologist and furniture producers acquire the skills and techniques in producing leather marquetry.

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CHAPTER ONE

INTRODUCTION

1.1 Overview

This chapter provides the basic structure of the research, outlining the background to the study, statement of the problem, objectives, research questions, delimitation, limitation, and significance of the study, definition of terms and organisation of the study.

1.2 Background to the Study

Leather is produced in traditional tanneries in the Northern and Southern parts of Ghana for all kinds of leather work activities by craftsmen in Tamale, Wa and Kumasi. The tanners basically use Vegetable tanning, which is the most traditional, classic and recognizable as compared to the rest of the tanning methods. The natural tannins bind with the proteins in the skin, convert it into the leather and give it unique characteristics used to create items such as bags, hats, sandals, belts and so on. Among the numerous uses of leather, its engagement in marquetry production is very limited in the world and non-existent in Ghana. Therefore, the indigenous vegetable tanned leather used as an alternative material in marquetry production is unknown to Ghanaian furniture industries.

The art of marquetry is the process of using wood veneers to create pictures; this technique is used in the production of decorative furniture and one noticeable feature of modern design in furniture is the revival of marquetry. This kind of decoration is subordinate to, the general design, but with the rage for novelty that prevails on the part of the public, marquetry in too many cases has developed into the production of all kinds of patterns in different veneers. (The decorator and furnisher, 1894

p.50)However, the meaning of marquetry and inlay often creates confusion this is ascertained by King (2008), that marquetry can be referred as inlay since each individual parts can be said to be ‘inlaid’ into one another. In actuality, genuine inlays cannot be alluded as marquetry since they are made out of segments in which a space is initially etched into the strong ground to be loaded with a piece slice to fit.

The aim of the research is to use Ghanaian indigenous vegetable tanned leather as a material suitable for marquetry due to the properties similar to wood veneer which is mostly used for marquetry. This technique will enhance the furniture industries to bring about innovation and creativity.

1.3 Statement of the Problem

The government has embarked on developing strategies to boost the national economy by improving upon the local industries of which Leatherwork plays an integral part. The leather industries produces items used by all kinds of people in Ghana for numerous purposes and some of these items are exported. In spite of the various uses of leather as a material for making items such as containers, body, household, religious, industrial, sports and recreation, there is more room for developing new ideas for Ghanaian indigenous vegetable tanned leather to be utilized in which marquetry is one of them.

The use of colour and grain pattern of wood veneer in creating pictures is what Hume (1998) and Smith (1995) have asserted on Marquetry. They further stated that, nowadays it is not common to acquire wood veneers with beautiful natural features like the frequency of growth rings, the colour tone variations between early wood and late wood, type of grain: wavy or curly grain, interlocked grain and so on, because the timbers are not allowed to mature enough before they are harvested. Marquetry

producers cannot solely depend on wood, since the forest is gradually depleting, hence scanty of quality wood. The need for alternative and suitable material like leather is very essential, other materials such as Metal and Straw can be used but it is difficult to permanently glue metal to the wood background and also change in temperature, causes the metal to expand and the wood ground to shrink relative to each other over time. Straw is not very durable, therefore leather stands the chance of been used since it is durable, workable, flexible, versatile and moisture absorbent which can easily be dyed in various colours to improve upon its natural beauty.

1.4 Purpose of the Study

To experiment on the potentials of Ghanaian indigenous vegetable tanned leather as alternative material for marquetry production.

1.5 Objectives

1. To identify the types of materials, characteristics and techniques for marquetry.
2. To identify the properties and characteristics of Ghanaian indigenous vegetable tanned leather that makes it suitable for marquetry.
3. To use leather as a potential material for marquetry in the production of selected living room furniture.

1.6 Research Questions

1. What are the types of materials, characteristics and techniques for marquetry?
2. What are the properties and characteristics of Ghanaian indigenous vegetable tanned leather that make it suitable for marquetry?

3. How can leather be used as a potential material for marquetry in the production of selected living room furniture?

1.7 Delimitation

The research is centred on identifying the properties of wood veneer and Ghanaian indigenous vegetable tanned leather relevant for the production of marquetry and the use of Ghanaian indigenous vegetable tanned leather as an alternative and suitable material for marquetry production. It is also limited to a selected leather sale centres in Kumasi metropolis of Ashanti region precisely Central Market and Rural Art Department (KNUST).

1.8 Limitation

The researcher found it difficult to identify sufficient number of furniture producers who have specialised in marquetry.

1.9 Significance of the Study

1. This research will help individuals to acquire the necessary skills and ideas in the use of Ghanaian indigenous vegetable tanned leather in the furniture industry for making marquetry products.
2. It will also provide information on an additional raw material for marquetry production.
3. This research will draw people's attention to the need to experiment on locally available raw materials for marquetry production.
4. The report on the study will serve as a reference material for further studies.

1.10 Definition of Terms

Chrome tanning – tanning pelts with chromium salts

Inlay – to set pieces of material into previously cut slots in a surface to form a decorative pattern.

Intarsia – wood inlay using different colours of wood, commonly used in furniture.

Leather - the processed hide of animals with the fur or feathers removed.

Pattern - a regular or repetitive form, order, or arrangement.

Tanning - the conversion of animal skins and hides into leather.

Tannery - a building or factory where animal skins and hides are tanned.

Tannins - a brownish or yellowish compound found in plants. Use: tanning, dyes, astringents.

Veneer - a thin layer of a material bonded to the surface of a less attractive or inferior material

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1.11 Organization of the Study

The research is portrayed in five chapters. The chapter one presents the Background to the study, Statement of the problem, Research questions, Delimitation, Limitations, Significance of the study and finally the Organisation of the study. Chapter two deals with the Review of related literature for the study, it made use of secondary sources of information such as books, journals, thesis and dictionaries to deal with pertinent issues related to the topic. Chapter three examines the methodology of the study and assesses the potentials of Ghanaian indigenous vegetable tanned leather in Marquetry production. Chapter four presents and discusses the results of the study. Chapter five is the concluding chapter where findings summary, conclusions and recommendations are also presented.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

2.1 Overview

The related literature reviewed in this chapter is based on theoretical and empirical foundation for the study. The review is structured under the following headings: theoretical concept of marquetry, historical overview of marquetry, adhesives for marquetry, marquetry finishing techniques, theoretical review on vegetable tanning, historical overview of Ghanaian indigenous vegetable tanning, procedures involved in indigenous vegetable tanning.

2.2 Concept of Marquetry

As indicated by Merriam – Webster Dictionary, the term marquetry is derived from a middle French word "Marqueterie" meaning inlaid work. Marquetry differs from the ancient craft of inlay or intarsia which sometimes induce perplexity, however marquetry can be portrayed as inlay because, every individual segment can be depicted to be "inlaid" into one another. Alternately, genuine inlay can never be marquetry as it is made out of a strong group of one material slice out to get area of another to form the surface pattern. In marquetry the outline is typically connected on top of a readied base material. One noticeable feature of modern design in furniture production is the revival of marquetry. (The Decorator and Furnisher 1984), this sort of decoration is very subordinate to the general design. But with the rage for novelty that prevails on the part of the public, marquetry has been developed in many cases into the production of all kinds of fantastic patterns in different veneers. Benson (2008), Smith (2001) and Hume (1998) are of the same perspective that marquetry is the specialty of utilizing the shading and the grain of wood veneers to create a

picture which is overlaid onto a solid background. The workmanship and specialty of marquetry is accomplished by cutting patterns or pictures from thin wood veneer and gluing it to a base of a suitable material which may be a piece of furniture, box or board. The materials utilized for marquetry incorporate metals, straw, shell, mother of pearl and wood veneer which is the main material. The easiest kind of marquetry is made with two sheets of veneer which are temporarily glued together and cut with a saw. At present, marquetry uses knife cutting technique and fret saw technique.

2.3 Historical Overview of Marquetry

According to American marquetry society (2007), the origin of marquetry is unknown, but it is believed to have its origin in ancient Egypt where the inlays were made in the king's palace Mausolus around 353 BC. The use of leather for marquetry was not popularly known in the past although leather was used to make clothing, shelter, carpets and even decorative attire in the prehistoric era. Boahin (2006) emphasizes that the production and use of leather is identified with the earliest artefact and recorded history of every known culture. During the 14th century, marquetry technique was advanced in Northern Italy for decorating cathedrals. Marquetry schools were established in France, Germany and Holland. Much attractive works were produced focusing primarily on decorating furniture especially for royalty in the 16th and 18th centuries.

Ultimately, marquetry protracted westward from Europe to America and beyond.

In the dark ages, people started to withdraw themselves from the practise. Only few workshops in Italy were practising marquetry later schools of marquetry were set to promote it. Marquetry technique was given a name "Intarsia Geometrica" which was

used to cover the entire surface of furniture. Over time, woodworking techniques spread to the rest of Europe, where the creation of the jigsaw blade was invented by an unknown German clockmaker making it easier for cutting of wood veneer near the end of the 16th century. It also speeded up the design cutting time by allowing the concurrent cutting of stacked sheets of veneer. The early uses of wood veneer for decorative purposes is emphasized by King (2008) that, the pharaohs of the ancient Egypt were familiar with furniture that was incorporated with thinly sliced sections of contrasting woods and semi-precious materials assembled in geometric designs.

Old Egyptian and Assyrian tombs have been uncovered, containing coffins and tables with a connected example of herringbone or basket weave. In those days, wood utilized for marquetry was 5mm to 13mm thick, though today with advanced precise apparatus and better process innovation veneer produced is about 0.7mm thick. Wood has not been the only material utilized for marquetry decoration.

Metal, stone, marble, ivory, mother of pearl, and bone, have all been utilized throughout the years with changing popularity. Little is known of marquetry until the thirteenth Century when a large number of craftsmen at the time were monks, and their work was by and large limited to the enhancement of chapel furniture, choir stalls, organizers and framing. In England, marquetry was presented by mainland skilled workers, and arabesque or ocean growth marquetry to improve clock cases, furniture, beds, seats, tables and chest.

In the most recent couple of decades marquetry has been industrialized, where natural wood veneers are utilized for "painting" pictures. It is currently a developing hobby, potentially as a response to the pace of present day existence with its clear uneasiness with engineered materials. Marquetry can be worked for delight, and even a little

benefit, and can discharge inventiveness in its specialists that they didn't know existed. It has the benefit of being a workmanship and art that just obliges a generally little expense for apparatuses and materials, and little specialist equipment. It is likewise a movement that can be honed by male and female alike, youthful or old, insofar as sight and manual expertise are not hindered.

According to the Encyclopaedia Britannica (2014), the process became popular in France in the late 16th century and received an enormous stimulus in the two following centuries as the European economy started to expand and created a demand for luxurious domestic furniture. The work of André-Charles Boulle, in the late 17th and mid-18th centuries, accomplished such magnificence that furniture embellished with marquetry pattern was known as Boulle work. The technique of marquetry was likewise exceptionally well known in Asia and it is conceivable to discover a lot of fine samples from China, India, Japan and Persia, and it is still drilled in these parts of the world.

2.4 Adhesives for Marquetry

There are three glues suitable for marquetry and are many more on the market, but these are single application glues which are intended for one purpose. It seems the research and development required to make glue compatible with all materials, under any condition, is too costly to pursue. One of the glues that are used is Titebond's Cold Press Glue. While this may be a good adhesive to glue up veneer panels, it is not usable for marquetry if the face side is assembled with veneer tape, the reason being that dampening the tape to remove it will cause the marquetry to delaminate. Contact cement is another adhesive that is useful in the above situation providing good

ventilation is available. Two coats of glue are applied to both the marquetry and substrate, using a slip-sheet to position the marquetry and with a veneer roller the work is pressed into place. The key is to apply 2-3 coats and arrange the substrate perpendicular to the marquetry.

According to Smith (1995), there are two separate gluing procedures during the making of a marquetry picture. The first is gluing the little inserts into their windows as the picture is assembled obliges a basic Polyvinyl Acetate based wood – paste, for example, Evostik Resin W. The second process; gluing down the completed picture to its base-board this permits more degree for the utilization of distinctive glue sorts. By and large, the novice will oversee acceptably utilizing the same Polyvinyl Acetate paste. Contact cements, such as Thixofix, can be helpful for veneering bended surfaces; however they can be cumbersome to utilize, regularly smell repulsive and may stay adaptable for quite a while, bringing on splitting of the completion. Urea – formaldehyde tars, for example, Cascamite, are favoured by a few workers, however they oblige cautious utilization.

2.5 Marquetry Finishing Techniques

Finishing marquetry work comes with different types of finishes: Rustin's plastic coating which gives an excellent finish but very pungent. Cellulose sanding sealer, lacquer spray, French polish and water base polyurethane which is also environmentally friendly, little or no solvent content, non-inflammable, very little odour, used indoors without harmful effects, cleans up with water and dries fast to a hard clear finish (Denton, 2015). After gluing the picture on the baseboard, it is allowed to dry completely and levelled to a smooth flat surface with a cabinet scraper,

since marquetry is characterised by even surface. This will avoid the veneer from peeling off from the baseboard. Hence leather is also made to have equal thickness by the secondary preparation of sanding, soaking and stretching which results in an even surface for marquetry. The picture is progressively sand with 100, 150 and finally 220 grit sand paper while applying sanding sealer. The surface is cleaned up very well with a tact cloth, brush or dampens cloth to remove the fine dust, and then the above finishes can be used to coat the surface of the picture.

2.6 Theoretical Review on Vegetable Tanning

Vegetable tanning method is considered as the earliest method of treating animal pelts with ingredients from nature such as tree barks, leaves, seeds and roots. This treatment given to leather improves its unique properties and characteristics used for producing functional items. According to Howes (1953), Sharphouse (1995) and Sarkar (2005) as cited in Asubonteng (2010), the origin of vegetable tanning is hidden in the mists of antiquity. It was discovered in the prehistoric times, that the properties of pelts would undergo a radical change when they are brought into contact with the aqueous extracts of certain roots and herbs. In Ghana, vegetable tanning is mostly practised as compared to other tanning methods. It has become a tradition to those who practise it, (Larbi, 2009). Vegetable – tanned leather is not steady in water, it has a tendency to stain, and thus if left to drench and afterward dry it will shrivel and turn out to be less supple and harder. In hot water, it will shrivel definitely and incompletely gelatinize, getting to be inflexible and inevitably fragile. Leather, normally vegetable – tanned can be oiled to enhance its water resistance. This supplements the common oils staying in the leather itself, which can be washed out

through repeated exposure to water. Continuous oiling of leather keeps it supple and enhances its lifespan drastically.

2.7 Historical Overview of Ghanaian Indigenous Vegetable Tanning

According to Boahin (2008) p.40, information on early professional tanning is based on oral history in Ghana. Leather tanning was not very popular among the indigenous people. It was only common among drum producers who were court artists. Tanning was not popular in an advanced state as craftsmen used mainly the cured hide and skins. Animals whose skins were used had to be hunted from the wild before their skins could be secured. He also stated that some Northern Nigeria immigrants of the Hausa and Fulani ethnicities settled in some popular cities in Northern Ghana such as Yendi, Tamale, Wa, and Bolgatanga to practise leather tanning as a family vocation in closed guilds. Some of these leatherworkers migrated to settle in Kumasi, and few of them were employed as court artists in the palace of the Asantehene (King of the Ashante's). These leatherworkers were made to produce some royal regalia such as traditional sandals (Ahenema), poufs, amulets, helmet, pendants and many others. Although tanning was done among most ethnic groups in Ghana in varied forms, the arrival of the Northern Nigerians enhanced the value of the trade; they produced beautiful leathers and leather articles such as slippers, sandals, belts, pouches, hats and poufs.

According to Larbi (2009), leather tanning has been practised in Ghana for over a century. The skills and techniques have continued as before and the tanners depict it as their custom and are not ready to change or enhance their abilities. The systems, instruments, materials and the environment of work have all continued as before for

that number of years. This has brought about low nature of the item, stagnate creation and impactful smell of the item because of inappropriate treatment of the leather.

Vegetable tanning is the method widely practised and the other methods are less known in Ghana. Acacia Nilotic which is locally known in Hausa as Bagaruwa is the common tannin used.Boahin (2005) as cited in Asubonteng (2010) emphasised that Bagaruwa(Acacia Nilotic) serves as the chief dependable source of astringency for vegetable tanning in Ghana. According to Fagg and Muggedo (2005), the pods of Acacia Nilotic are used traditionally in Nigeria and other sub-Saharan countries for tanning leather and as a source of cream-to-brown dyes if used without a mordant.

2.8 Procedures Involved in Indigenous Vegetable Tanning

Indigenous vegetable tanning is a traditional way of converting pelts into leather by using tannin known as Acacia nilotica locally known in Hausa as “Bagaruwa”. This method does not consist of any modern technologies and machineries but it is done manually. The raw material is acquired by removing the outer covering of the animal after it has been slaughtered in abattoirs and this is the first pre-tanning procedure known as flaying. The raw material or the pelt is submerged in pits containing lime solution in order to loosen the hair and the epidermal layer to open up the fibre structure to make it receptive to the tanning agent. This process is called liming. Dehairing is done by placing the pelt on a cylindrical wooden beam and with the help of a blunt knife (scraping knife), the hair on the pelt is scraped off. This process is very important in the sense, leather with the hair or fur still on becomes difficult to notice the grain pattern which is one of the characteristics of marquetry. The specific direction of the grain pattern creates the effect of images in the marquetry. Defleshing is the removal of excess flesh; fat and muscles found on the flesh side of the pelt, this

process helps to reduce the excessive odour. The pelt is tanned as mentioned above with *Acacia nilotica*. It is pounded into powder, soaked in water with the leather and allowed to stay in the solution for a day. It is then removed from the solution, squeezed and dried.

2.9 Properties and Characteristics of Leather for Marquetry

Leather has unique properties and characteristics which emanate from the type of animal pelt as well as the mechanical and chemical operations used in obtaining the leather. This is emphasised by Asubonteng (2010) that, the properties of leather vary considerably depending upon the type and quality of both the raw material and the tanning process employed. The major properties of leather are in the fibre network layer. It consists of long wavy bundles of collagen fibrils, which has been arranged in a network perpendicular to the surface. Tanning fixes the ionisable side groups of the collagen fibrils by increasing hydrogen bonding between collagen molecules, these help make leather pliable. The post tanning procedures likewise induces additional properties to the leather for intended purpose.

Wood veneer which is mostly used for marquetry possesses the properties which effectively meet the characteristics required for the production of marquetry in terms of colour, grain pattern, thickness, aesthetic, durability and pliability. Leather which is versatile can also be manipulated to attain the necessary characteristics of marquetry. Colour which plays a vital role in marquetry as opined by Philip (1997), that marquetry is 'Painting in Wood' because of the different colours of wood veneer used. This can also be said as 'Painting in Leather' since leather has the affinity for dyes; both natural and synthetic dyes of different colours can work successfully on the leather to improve its aesthetic quality this has been proven by Boahin (2008). The

essence of colour in marquetry is to depict realistic effects or represent ideas of things in the picture. However, in marquetry even surface is important therefore any material used must have equal thickness to avoid the edges of the inlaid peeling off and also to enhance the finishing of the work. Leather has a slight thickness variation throughout, the Shoulder part is thick and strong but tends to crease easily as this part of the leather is affected by movements. The Butt part, the fibres are tightly packed and hence the strongest and thickest part of the pelt. Belly part is quite thin and the Back is the best part of the leather for leatherworks. The thickest parts are worked on to reduce their thickness by skiving or rubbing the flesh side with an abrasive paper and the thin ones are reinforced with lining. Leather can serve as alternative material for marquetry due to its numerous properties, this is emphasised by Scott (2011) that, leather is not only a quality material but also very strong and therefore very durable. It can be manipulated to meet the characteristics needed for marquetry.

CHAPTER THREE

METHODOLOGY

3.1 Overview

This chapter comprises the processes followed in conducting the research. It is organised as follows: the research design, population, sampling, instrumentation, data collection procedure and data analysis plan.

3.2 Research Design

Neville (2007) asserts that research is a process of enquiry and investigation; it is a systematic, methodical and ethical; research can help solve practical problems and increase knowledge. According to Given (2008) as cited in Larbi (2009), that research design refers to the way in which a research idea is transformed into a research project or plan that can then be carried out in practice by a researcher or research team. Essentially, the research design creates the foundation of the entire research work. The design helps perform the chosen task easily and in a systematic way. When choosing the appropriate research design as a means to unravel the situation at hand and to achieve the objectives of the research, the qualitative research paradigm was adopted; specifically experimental and descriptive methods were used.

Brikci and Green (2007) opined that, the qualitative research is characterised by its aims, which relate to understanding some aspect of social life and its methods which in general generate words rather than numbers as data for analysis. It also provides the systematic approach in unfolding the possible ways of identifying the properties of Ghanaian indigenous vegetable tanned leather relevant for marquetry production. The descriptive method was used to describe and explain the types of materials, techniques and characteristics of marquetry. Experimental method was also adopted

together data to answer research question three and to meet the demand of objective three for the study.

3.3 Library Research

Literature documented was gathered from the following libraries:

- KNUST Main, library. Kumasi
- Faculty of Art Library. Kumasi
- Kumasi Polytechnic Main, Library
- The University of Education Campus Library, Kumasi

Other sources include data collected from internet and documentary sources from books, unpublished thesis, journals and periodicals.

3.4 Population for the Study

Polit and Hungler (1999) refer to the population as an aggregate or totality of all the objects, subjects or members that conform to as a set of specification. A research study population is a well-defined collection of individuals or objects known to have similar characteristics. The number of persons or objects covered by the study or with which the study is concerned is what Oswala (2001) refers to as population. In other words, it is a set of people or items under consideration in a study. The target population for the study is heterogeneous in nature and it was made up of leather technologist, wood technologist, leather artisans and wood artisans

3.5 Sampling Technique

Babbie (2001) opines that a sample is a subset of the population being studied. It represents the larger population and is used to draw conclusions about that population.

Sampling technique is used in the social sciences as a way to gather data about a population without having to measure the entire population which is not easy to access due to its heterogeneous nature. However, the researcher chose two sampling techniques to conduct the research.

Random Sampling: Members of the population stand an equal chance of being selected; hence, the leathers for the production of marquetry were selected randomly.

Purposive Sampling: It was used to select the parts of leather thus, back, butt and side based on the average thickness required for marquetry. This sampling technique was employed because of a particular purpose for the study.

3.5.1 Sample Size

Table 3.1: The results of sample size

Population	Places	Sample size
Leather technologists	IRAI (KNUST) Polytechnic (Kumasi)	4
Wood technologists	Kumasi Polytechnic(Kumasi)	4
Leather artisans	Kumasi	15
Wood artisans	Kumasi	27
Total		50

Based on the above data, the researcher considered a sample size of 50 to be a representation of the total population.

3.6 Data Collection Instruments

Ashitey (2013), states that Data Collection Instruments are special tools used by researchers for the execution of plans towards the achievement of established goals.

In this study, observation and interview were the main instruments employed.

3.6.1 Observation

Turkson (2011) explains that when conducting research using an observation method, one is supposed to collect data on a particular subject or an issue through watching, or witnessing an event or activity recording and interpreting what one is actually observed. Observation brings the investigation into contact, in one way or the other, with the phenomenon being studied. In this way, it becomes an effective means of recording what is observed more precisely and with a greater reliability, because judicious observation directs the attention of the researcher to what to select, what to admit and to what questions are relevant to ask in specific research situations relating to the particular research problem being investigated, Kumekpor (2002).

Non – participant observation was employed by observing the activities from outside the group. A visit was made to the Sokoban Wood Village (wood artisans) to seek for first – hand information needed for the study. However the researcher observed the different techniques involved in wood veneer for furniture making, this helped to design and construct marquetry using Ghanaian indigenous vegetable tanned leather.

3.6.2 Interview

Kumekpor (2002) opines that interview is the art of asking questions relevant to a subject of investigation and recording answers. It is a conversation between two categories of people. But it is a conversation with a different. This conversation involves two parties, who are relative strangers to each other and / or, who hardly

know each other and most probably, will never see each other again after the conversation. The researcher interviewed some people who are well versed in Leatherwork and woodwork in the various institutions most especially KNUST and Kumasi Polytechnic to obtain vivid information for the study. A group of wood artisans were also interviewed in the Sokoban Wood Village, for their general view on wood veneer for furniture construction. Since, some of the respondents visited were uneducated; the researcher had a normal conversation with them. The conversations were taped unaware.

3.7 Validation of Instruments

The observations and interview guides were organized, vetted to check the authenticity before administering to the respondents. In doing this two professional leather and wood workers were consulted to make the necessary corrections to improve upon the validity of the instruments.

3.8 Primary Data

Primary data were obtained from the interviews and observation conducted during the research. Views from experts and knowledgeable personalities in KNUST, Sokoban Wood Village, Anloga and Central Market were interpreted and recorded.

3.9 Secondary Data

Secondary data comprised information collected from books, articles and published thesis, internet, journals and others that were related to this study.

3.10 Data Collection Procedure

The researcher prepared a question guide for each of the respondents to gather the primary data needed for the research. Structured interviews were conducted for data collection from leather technologists, wood technologists, leather and wood artisans in Kumasi. The various sites: Sokoban Wood Village, KNUST Department of Integrated Rural Art and Industry, Kumasi Polytechnic and Central Market were visited whereby; observations made were interpreted and recorded.

Adequate data were also collected from books, publications, thesis, and internet hence served as the secondary data. Based on these the researcher identified the various materials, techniques and characteristics applicable to the study.

3.11 Data Analysis Plan

The primary and secondary data collected were assembled in tables and then analysed to derive the findings for the study. This is shown in the next chapter.

3.12 Data Collection for Objective One

What are the types of materials, characteristics and techniques for marquetry?

The objective of this research question was to identify the types of materials, characteristics and techniques for marquetry. The data collected from scholarly journals, books, internet, interviews and observations recorded indicated that materials such as wood veneer, metal, straw, horn, shell and mother of pearl are used for marquetry. Even surface, colour pattern, grain pattern, aesthetic and texture are the characteristics of marquetry and the techniques are as follows; inlaying technique, sliverisation, bevel knife cutting, bleaching wood, fret saw silhouette, hanger tip, using fret saw or knife, transferring simple patterns, cutting oval or circular borders and sand shading. Besides, most Ghanaian wood artisans the researcher interacted

with indicated that the known materials they have been accustomed with is the use of wood veneer and metal, these have been discussed in the next chapter.

3.13 Data Collection for Objective Two

What are the properties and characteristics of Ghanaian Indigenous Vegetable Tanned Leather that make it suitable for marquetry?

The objective of this research question was to identify the properties and characteristics of Ghanaian Indigenous Vegetable Tanned Leather suitable for the manufacture of marquetry. To answer the question, the following activities were carried out to find out whether the properties of leather can meet the characteristics required in marquetry production. Since marquetry is noted for even surface (even thickness of materials used), colour pattern, grain pattern, aesthetic and texture.

Activity 1: Assessment of Even Thickness

Table 3.1: leather thickness assessment

Parts of Leather	Average Thickness (mm)
Butt	0.26mm
Shoulder	0.37mm
Back	0.35mm
Side	0.24mm
Belly	0.12mm

(Source: assessment conducted by the researcher – August 2014)

Full leather was cut into the various parts shown in the table above. Samples were cut from each part; their thicknesses were measured with an Electronic micrometre and were recorded.

Activity 2: Assessment of Pliability (Flexibility)

The pliability of the leather was tested by using the hand to feel and bent it for easy manipulation. Nine leathers were bought from Kumasi precisely Integrated Rural Art Department (KNUST). Three of these leathers were a little harder. The researcher sanded the flesh side of the leathers and later soaked in water and dried. This property helped the researcher to acquire the right leathers for the intended purpose.

Activity 3: Assessment of Affinity for Dyes

The researcher observed that leather has the ability to absorb water, oil and dye. The local tanners mostly dyed their leather using natural dyes which are black, red, brown and khaki as ascertained by Boahin (2008). Different colours can also be achieved with suede dye and even vat dye.

Activity 4: Assessment of Resistance to Stains

Leather is very absorbent and can easily be stained. To make leather durable for marquetry work, the surface treatment must be taken into consideration. The researcher grouped leathers into two categories; A, and B for surface testing. Category A, the surface was coated with wax and lacquer and category B, the surface remained uncoated. The results were recorded.

Activity 5: Assessment of Hardness

The hardness of leather was determined by the hot water method. The researcher boiled water to 100 degree Celsius, the leather was put in it for about 15mins. It was removed and dried.

3.14: Data Collection for Objective Three

How can leather be used as a potential material for Marquetry in the production of selected living room furniture?

After testing for the properties of leather, the next step was to use leather as a marquetry activities performed.

Activity 1: Preliminary sketches

Series of sketches were made for the intended purpose. This helped the researcher to select from the series of designs and the chance to have the final design in view.



Plate 1: Sketching of final design



Plate 2: Final sketch of Design One

(1A)

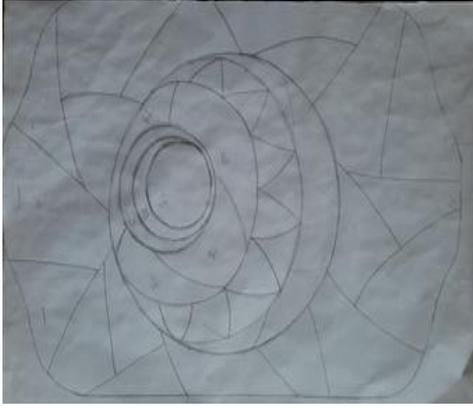


Plate 3: Design One (1B)



Plate 4: Design Two (2A)

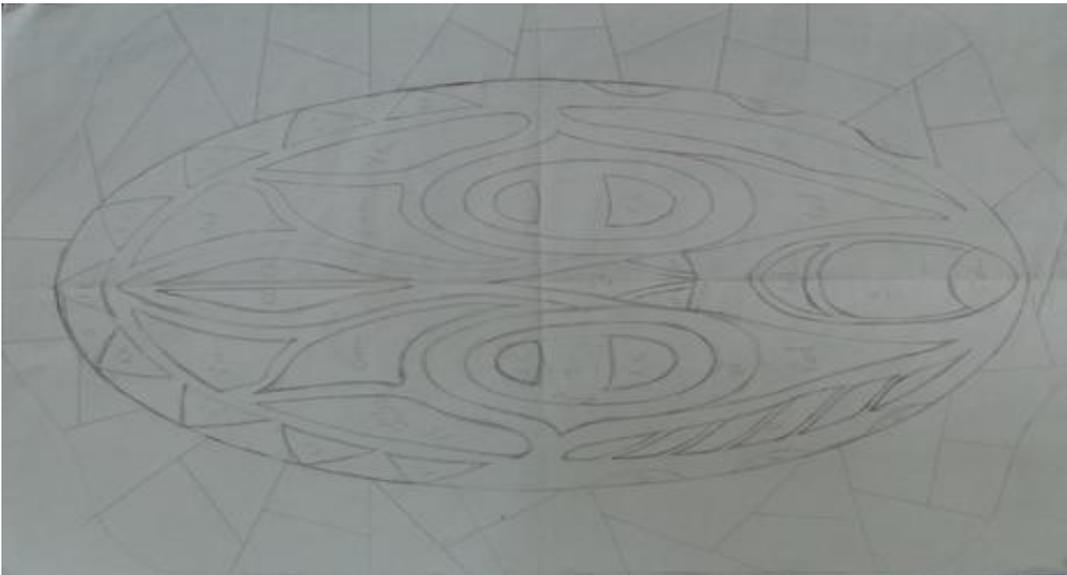


Plate 5: Design Two (2B)

Activity 2: Secondary Preparation of Leather

The leathers purchased from Central market were found unpleasant because of their excessive flesh and repulsive smell. There was the need for leathers to be treated to suit the intended purpose. The following were the activities for the preparation of the leather.

Sanding

The flesh side of the leather was placed on a table and sanded with abrasive paper to remove the excess flesh from the leather and to enable the researcher to acquire the intended thickness of the leather.



Plate: 6 (A and B), Sanding the flesh side of the leather

Soaking / Washing

To reduce the unpleasant smell, the researcher added lime juice to water and immersed the leathers in the solution and washed. The leathers were then rinsed in another basin of water with toilet soap.



Plate 7 (A and B): Soaking and washing of leathers

Stretching / Drying

The stretched leather on a wooden board was dried under a shade to help the tannins, dyes and oil to spread evenly through the leather.



Plate 8: Stretching of leather



Plate 9: Drying of leather

Burnishing

The selected leathers were given a glossy effect by rubbing the grainy sides with a Champaign bottle. The leathers were ready for use.

Activity 3: Organization of Tools and Materials

Brush: It has a bristle hair fastened in wood or plastic at one end with metal. It was used for applying glue or adhesive.

Metal rule: It was used for measuring and marking on leather.

Utility Knife: This tool was used for cutting leather and cardboard templates.

Scissors: It is a cutting instrument with two blades which cut as they come together. It was used to cut templates and pieces of leather.

Pencil: It is a narrow piece of wood containing black or coloured substance. It was used for sketching, marking and tracing out outlines on leather for cutting.

Leather: This is made from animal skins or hides which have been chemically treated to preserve quality and natural beauty. It was used as a material for the marquetry work.

Adhesive (99): It was used as a bonding material to hold together the pieces of leather to the various shapes of the templates.

Chip board: It is a light paper which was used for the templates.

Sandpaper: This was wrapped around a little block of wood to make sanding easy and faster. Sanding removes the bits of flesh which remain after tanning and also make the flesh side smooth.

Flat wooden board: It was used as a working surface for cutting templates.

Thumb Pins: it was used to stretch leathers.

Activity 4: Construction of Leather Marquetry, (The first set of a centre table and two coffee tables).

Transfer of design

The design was transferred on the chip board and used as template. The various colours of the designs were indicated and these were Black, Red, Cream and Brown. The dominant colour of the design was Cream; hence Cream leather was used to cover the whole surface of the wooden board with the help of synthetic glue (99).

Cutting of templates: Parts indicated red were first cut out from the template, followed by black and lastly brown.

Tracing templates on leather: Cut out pattern was placed on the wooden board covered with cream leather. The first colour which was cut off from the template was traced on the base.

Cutting shapes from the base leather: The base leather with the tracing marks were cut and traced on the required leather and glued on the base.

Burnishing the surface of the work: The surface of the work was burnished to attain lustre and smooth surface for the work.

Design One (1)



Plate 10: Covering the wooden board

Plate 11: Tracing the shape of

With cream leather the board onto the cream leather



Plate 12: Burnishing leather

Plate 13: Excess leather cut to the desired shape



Plate 14: Traced design on cream leather



Plate 15: Cutting off the red portion on



Plate 16: The portion marked red



Plate 17: Gluing the black leather on the wooden board



**Plate 18: Complete arrangement of patterns on the wooden board
For Design One (1)**

Design One A (1A)



Plate 19: The parts marked red were cut off from the background



Plate 20: Arrangement of the red patterns on the background



Plate 21: Complete arrangement of Patterns for Design one (1A)



Plate 22: Folding the excess leather under the wooden board

Activity 5: Construction of Leather Marquetry, (The second set of a centre table and two coffee tables).

Transfer of design

The design was transferred on the chip board and used as template. The various colours of the designs were indicated and these were Black, Red, Cream and Brown. Black leather was used to cover the whole surface of the wooden board with the help of synthetic glue (99), because Black was the dominant colour in the design.

Cutting of templates: Parts indicated Black were first cut out from the template, followed by Red, Cream and lastly Brown.

Tracing templates on leather: Cut out pattern was placed on the wooden board covered with the Black leather. The first colour which was cut off from the template was traced on the base.

Cutting shapes from the base leather: The base leather with the tracing marks were cut and traced on the required leather and glued on the base.

Burnishing the surface of the work: The surface of the work was burnished to attain lustre and smooth surface.

Design Two

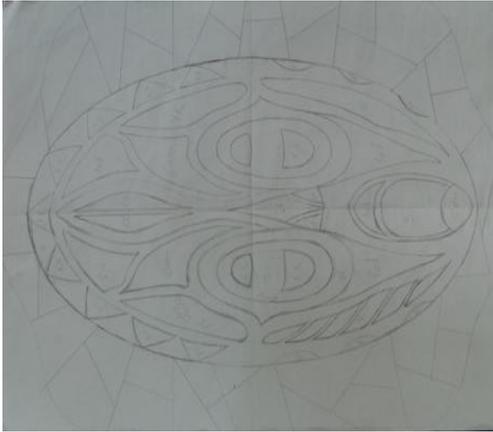


Plate 23: Final sketch for design two



Plate 24: Applying glue on the surface of the wooden board



Plate 25: Pressing for good contact



Plate 26: Joining the cream patterns



Plate 27: Complete arrangement of the red patterns



**Plate 28: Arrangement of patterns of
Design 2A**



**Plate 29: Complete arrangement of patterns
of Design 2A**



Plate 30: Wooden board covered with black leather



Plate 31: The portion marked red was cut off from the Background leather



Plate 32: Arrangement of red patterns



Plate 33: Arrangement brown patterns



Plate 34: Complete arrangement of patterns for Design Two (2B)



Plate 35: Wooden Stands for the tables

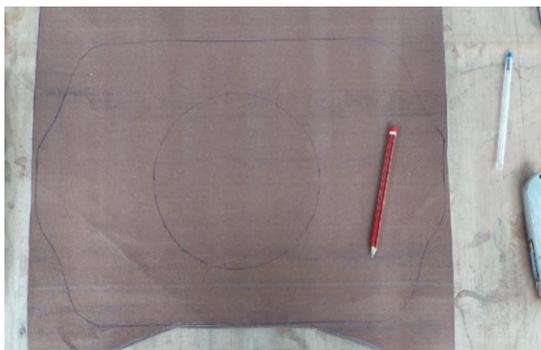


Plate 36: Marking the areas for joining



Plate 37: Marked are



Plate 38: Nailing the wooden stand to the board



Plate 39: Computer design drawing for design one (1)



Plate 40: Computer design drawing for design two (2)



Plate 41: Final Work without Finishing Treatment



Plate 42 A and B: Staining the Base of the Tables.



Plate 43: Final Work (1A) – Marquetry on Centre Table



Plate 44: Final Work (1B) – Marquetry on Coffee Table



Plate 45: Final Arrangement of the First set of Centre and Coffee Tables



Plate 46: Final Work (2A) – Marquetry on Centre Table



Plate 47: Final Work (2B) – Marquetry on coffee table



Plate 48: Final arrangement of the Second set of Centre and Coffee Tables

CHAPTER FOUR

PRESENTATION AND DISCUSSION OF FINDINGS

4.1 Overview

This chapter focuses on the presentation and discussion of results as well as the field research findings which have been tabulated below. Reference to observations, interviews and theories were the basis of finding the results for objective one and two and the outcome has been deliberated upon.

4.2 Details of Respondents

Table 4.1: Details of respondent for the study.

No.of Respondents	Respondents	Educational Background	Working Experience
4	Leather technologists	Doctoral Degree (2), Master's Degree (1), First Degree (1)	5 – 20 years
4	Wood technologists	Master's Degree (3), First Degree (1)	5 – 10
27	Wood artisans	“O” level(4), JHS(10) Uneducated(13)	8 – 30
15	Leather artisans	Diploma (4), “O” level(2), SHS(3) Uneducated(6)	10 – 20

(Source: field research conducted by the researcher – August 2014)

As indicated by the outcomes introduced in table 4:1, the aggregate number of respondents for the study was 50; 4 leather technologists and 4 wood technologists at KNUST and Polytechnic (Kumasi) respectively with working knowledge ranging from 5 – 20 years. These respondents are knowledgeable in their general area of study taking into account their instructive foundation. 27 wood artisans and 15 leather

artisans were likewise met with working experience from 8 – 30 years. A large portion of these respondents are uneducated; along these lines the researcher had a usual conversation with them in requesting for information.

Table 4.2: Results of the types of materials used for marquetry by the wood artisans in Ghana.

Types of materials used	No. of wood artisans	Percentage (%)
Wood veneer	21	77.8%
Metal	6	22.2%
Ghanaian indigenous vegetable tanned leather	0	0%

(Source: field research conducted by the researcher – August 2014)

The above data collected indicates that wood veneer is mostly used to have the largest percentage, followed by metal and Ghanaian indigenous vegetable tanned leather having no percentage, since the wood artisans do not use it. Therefore, indigenous vegetable tanned leather used as an alternative material in marquetry production is unknown in the Ghanaian furniture industries.

Table 4.3: Respondent’s knowledge on leather marquetry

Opinions of respondent on whether Ghanaian indigenous vegetable tanned leather can be used for marquetry		
Responses	Yes	No
Leather technologist and Artisan	5	14
Wood technologist and Artisan	2	29
Percentage	14%	86%

(Source: field research conducted by the researcher – August 2014)

A large number of respondents (86%) were of the view that Ghanaian indigenous vegetable tanned leather cannot be utilized for marquetry in light of the awful impactful scent of the material and 14% of the respondents were additionally of the view that, if the recent is given a decent treatment, it can be utilized.

4.3 Findings on the Types of Materials for Marquetry

Wood veneer



Plate 49A and B: Marquetry made with wood veneer (retrieved from Wikipedia, 2015)

The findings show that wood veneer is the primary material used in marquetry, because, the properties of wood veneer effectively meet the characteristics required for the production of marquetry in terms of its colour, grain pattern, texture, aesthetic and equal thickness which are used to create the desired artistic impressions. Also, the researcher realized that the accessibility and technical know-how of the use of this material is the primary reason behind the dependence of local Ghanaian wood artisans on it. Besides, most customers have also not been exposed to the use of other materials, hence, their continuous choice of wood veneer products.

Metal



Plate 50: Marquetry made in Metals, retrieved from Wikipedia 2015)

The researcher found out that most common metal used for marquetry especially Boulle Marquetry is brass, which is a mixture of copper (red metal) and zinc (grey metal) which has a yellow colour similar to gold. Copper, pewter or silver are sometimes used. According to Stover (2013), the use of metals is enabled by prior

knowledge of marquetry using wood veneers, this helps to select different characteristics and colours for the project.

Straw



Plate 51: Straw Marquetry Alexander Lamont (Retrieved from Wikipedia 2015)

Straw marquetry, the researcher noted that it is just like that of wood marquetry, except that straw replaces the wood veneer. It is believed to have first been practised in the East. Geometric shapes, stars and flower motifs are the most common themes. The preparation of straw for marquetry is slightly different; however the straws are soaked, split and ironed before they are used for the project. The origins of straw marquetry have their roots in Asia where straw has many uses in everyday life. In Japan, it is called ‘Mugiwara zaiku’ and has been around for nearly 300 years. In the west, it has been practiced since the 17th century when it was considered an acceptable hobby. (Marquetry Time, 2007). However, straw marquetry is not very durable as compared to other materials used for marquetry production.

Horn



Plate 52: Horn Marquetry (2015) Retrieved from

<https://www.google.com.gh/search?q=horn+marquetry&biw=1536&bih>

The researcher's investigation also revealed that a pointed projection of a skin on the head of animals is used for marquetry, this is ascertained by Gross (2000) that cow's horn can be made into thin transparent sheets. The back of the horn can be painted with either a blue pigment or a green one for the production of marquetry.

Mother – of – pearl



Plate 53: Pink Goldfish Mother-of-Pearl (2015). Source, www.patrickvoillot.com

The analysis of data collected revealed that Mother of pearl, also called 'nacre' is an iridescent layer of material that forms the shell lining of many mollusks. Pearl oysters and abalone are both sources of this substance, which is widely used as an inlay in jewellery, furniture and musical instruments.

This material comes in different colours, but normally bleached and dyed for decorative purpose. Gross (2000) is of the view that, although mother – of – pearl is rarely used, it can sometimes be found on Boulle marquetry. This material is very hard and can be obtained from certain species of shell. It has the property of iridescence which makes it so attractive.

Nacre or mother – of – pearl has layers which tend to reflect particular wavelengths that are colours depending on their thickness and on the angle of the light.(WiseGEEK, 2014) It was further stated that, when viewed from different angles, different colours are reflected. The irregularities on the surfaces make every piece of mother – of – pearl unique and good for marquetry.

4.4 Characteristics of Marquetry

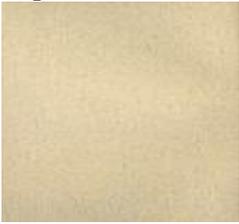
Taylor (2003) opines, marquetry pictures are inspired by existing works of art, usually paintings but occasionally they are original pieces produced specifically for marquetry.

Marquetry is seen in two forms, these are Pictorial Marquetry and Applied Marquetry. Pictorial marquetry is created in a complete or free-standing picture, whilst applied marquetry is made on or laid on a surface of an object. Marquetry which is often made with wood veneer is characterized by its colour, grain pattern, texture, aesthetic and even surface.

Colour Pattern

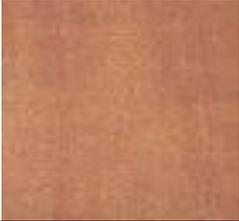
Colour plays a vital role in art especially in marquetry, this is emphasized in Humes (1998) that marquetry is the art of using the colour of wood veneer to create picture which is overlaid onto a solid background. Every individual wood species has its own unique structure and colour tone provided by nature which has been used predominantly for centuries as a means of decorating furniture and wooden artefacts. According to Philip (1997), the pictorial technique employing colourful woods became particularly popular in the 18th century as ‘Painting in Wood’ by craftsmen. Colourful wood veneers are used to achieve realistic effects but when the natural colours available failed to give the desired range of colours, artificial colouring agents can also be successfully used. Moreover, to attain a lighter or darker colour of wood veneer, it is most at times bleached or heated to acquire the desired tone of colour for the work.

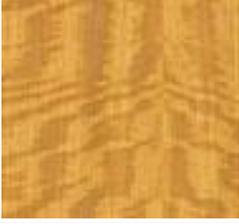
Table 4.4: Types of wood veneer; their colour and ideas for the types of things they can represent.

TYPE OF WOOD	COLOUR OF WOOD	IDEAS OF THINGS REPRESENTED
Aspen 	Cream to Pink	Costume, drapery, sky, window waster
Avodire	Yellow to Gold	Distant fields, floral subjects, sky

		
<p>Beech</p> 	<p>Cream to Pink</p>	<p>Ocean beaches, mountains, stonework</p>
<p>Birch</p> 	<p>White to Cream to Pink</p>	<p>Floral, portrait, sky, water</p>
<p>Cedar</p> 	<p>Cream to Pink</p>	<p>Costume, doors, roof, sky</p>

<p>Cherry</p> 	<p>Pink to Biscuit</p>	<p>Fences, roads, sky, stonework</p>
<p>Ebony</p> 	<p>Dark brown to Black</p>	<p>Planks, rocks, shadows, tree trunks</p>
<p>Hare wood</p> 	<p>Silver Gray to Black</p>	<p>Costume, mountains, snow scenes, water</p>
<p>Holly</p> 	<p>White</p>	<p>Floral, sails, snow scenes</p>
<p>Marple</p> 	<p>Cream to Pink</p>	<p>Fields, floral, mountains, portrait, rocks, sky</p>

<p>Oak – White</p> 	<p>Biscuit to light Tan</p>	<p>Borders, fences, mid-distant fences, wall</p>
<p>Oak – Red</p> 	<p>Cream to Pink</p>	<p>Drapery, floral, rocks, sky, snow, water</p>
<p>Paduak</p> 	<p>Red –Dark Red</p>	<p>Costume, floral, planks, portraits, roofs</p>
<p>Pearwood</p> 	<p>Biscuit to Light Red</p>	<p>Drapery, floral, portrait, shadows</p>
<p>Purple heart</p> 	<p>Purple Brown</p>	<p>Costume, hills, roofs, walls</p>

Prema-vera 	Yellow to Gold	Beaches, costume, floral, sky effect
Satinwood 	Yellow to Gold	Ocean beaches, corn fields, drapery, floral drapery
Rosewood 	Orange to brown to purple	Drapery, foreground, mountains, roofs, tree trunk
Teak 	Gold to light brown	Fences, fields, mountains, rocks, tree trunk

(Source: American marquetry society 2007)

The data show the most common wood veneers used in marquetry, an example of their colour, and ideas for the type of things they can represent in marquetry to create artistic impressions.

Grain pattern

In marquetry, a beautiful result is achieved by the natural grain pattern of wood veneer used. According to Marino (2009), the actual grain pattern of a piece of wood

is often determined by the way it is sliced from the log. The way veneer is cut off the log determines the appearance of the grain. Veneer cut from the same log have an entirely different appearance if cut using different methods.

MacGregor (2004) states that, the grain pattern seen on the surface of a veneer is known as the “figure” and it results in two main factors;

- The interaction of natural features e.g. the frequency of growth rings, the colour tone variations between early wood and latewood, type of grain (wavy or curly grain, interlocked grain), medullary rays, markings and pigments in the wood structure, burls or curls.
- The way the flitch is cut.

The grain pattern may be described as straight, wavy, interlocked, irregular, spiral, flamed, quilted or fiddle back, burrs and curls. The specific direction of the grain of the veneer can create the effect of water flowing, layered feathers, soil profiles, leaf veins, and shadows in the picture.

Aesthetic

Wood veneer is a natural material and a renewable resource. Its beauty comes from nature, but can be enhance by man. Each wood species has unique characteristics, but the manner in which the wood is sawn or sliced produces beautiful grain patterns. The beauty of marquetry comes from the wood. The wood has its own natural colour, texture and grain pattern which is arranged to form a picture. In marquetry, the way the wood veneers are joined or laid together, how they are stained or dyed, and how they are finished enhance the aesthetic quality of the work.

Texture

Beals and Davis (1977) explain that wood texture depends on the size distribution and proportional volumes of cellular elements composing wood, depending on relative sizes and distribution of cellular elements, texture may be fine or coarse, even or uneven. Texture is a term used to classify relative size of wood elements. Wood is considered fine- textured when individual elements are so small that they cannot be distinguished individually with a hand lens. Coarse- textured wood have large individual elements that often can be observed without magnification. Some woods like oak are coarse textured, mahogany is medium textured and sycamore is fine textured.

Even Surface

Pieces of wood veneer used in creating pictures in marquetry must have an even surface or equal thickness, this is achieved by using abrasive paper to rub on the surface of veneer or to measure the thickness of the veneer to acquire equal thickness for the work. A good finish enhances the work when the surface is smooth and has an even surface.

4.5 Techniques in Marquetry

Inlaying Technique

Slender lines are sometimes needed to be decorated with veneer as hairs, whiskers or tree limbs in a point by point scene. Straight lines are easy to make with a knife and ruler whilst bended lines are hard to make, however the fret saw can deliver bended lines of a reliable width. MacKeracher (1998) discloses that to inlay fine lines with

veneers, focus the thickness of a line to be trimmed and select fitting fret saw cutting edge for the work. This procedure is finished by putting cellophane tape on both sides of the host veneer covering the line. With the front side up, the work is sawn along the line with edge opposite to the table. A piece of waste veneer or cardboard is taped to the work's back to diminish fraying of the host veneer. The line's cutting begins toward the line's end where the beginning gap will be unmistakable. Veneer with straight, fine and even grain is chosen for the decorating and put on a level surface with the edge trimmed utilizing a blade situated against a straight edge running parallel to the grain. Slight portions of veneer are additionally cut with the knife and straight edge so that the strips are about 1 times the thickness of the host veneer. The strip is taken and slice to the saw's length cut or somewhat bigger, considering any shape. This strip is put between two pieces of sandpaper on a level surface and after that sand until the craved thickness is accomplished. Pushing the strip edgewise into the cut, trim any overabundance off the strip's end and pushed it into the host veneer. Glue is spread around the strip and allows drying.

Cellophane tape on the front and back of the host veneer is removed, and then the surface of the work is scraped.

Sliverization

This is a special technique in which a group of thin slivers of veneer are glued together to act collectively as a piece of veneer. (MacKerche, 1998).

The sliverization technique involves the use of variety of surface grains to create a piece of veneer in small slivers and integrate them in separate pieces. The best veneers for sliverization give straight and refined grains which are arranged parallel in a smooth flowing pattern, effective for hair, grass, bushes and birds' nests.

Slivers are made by selecting best veneers which have straight and fine-grain. The veneer's edge is trimmed with a blade and straight edge, verifying the edge is parallel to the grain. Place veneer between two bits of wood, with projecting over this wood underpins. Set the iron's profundity of a plane to create the coveted thickness of bit. The veneer is drawn over the plane, delivering twisted slivers. Sometimes the shavings separate when planed, particularly with weak, dry or coarse-grained veneer. One of the cures is to delicately damp the veneer with water.

Bevel Knife Cutting

The most common technique utilized as a part of knife cutting is known as the window method. It is a simple approach to cut marquetry pictures with knife from the front utilizing the window technique joined with bevel cutting. Cut window with handle of knife tilted inwards centre. Vertically, cut the remaining to be used as a template. Place piece of veneer under window and fasten with masking tape. Mark line lightly with knife, handle tilted inwards. Remove masking tape, separate veneers and cut to insert veneer. Handling of knife this time is tilted outwards. Check veneer for fitting and glue.

Bleaching Wood

Darkening a range of a picture, sand shading can be utilized to give profundity and subtle element in the marquetry picture. To additionally lighten a range of a picture, bleaching can be utilized. Not all woods act the same to bleaching; a trial is done with the bleach on the kind of wood and the time of exposure to bleaching before neutralizing. At the point when testing, a precise time of presenting the wood to the bleach must be recorded, and afterward in the wake of drying watch the impacts. Bleaching must be neutralized or else the response will proceed until the wood is dry. The strongest wood bleach is commercial wood bleach comprising of two bottles Part

A and Part B (Sodium Hydroxide). Ten second exposure to this bleach without neutralizing will expel the greater part of the colour from the wood and the wood is neutralized with water after the sought bleaching time.

Fret Saw Silhouettes

The method creates a silhouette of a pattern, inlaid into a veneer. Contrasting veneer grain is used to create an outline of a selected pattern; a photograph or a flower.

Once the form is drawn, penetrate the veneer pieces with a fret saw and shape them. The two singular identically shaped pieces collaborate to form a shadow on a surface. The diversity of the two-layered grains will add dimension to work and create a pattern with an almost holographic outline. The silhouette method is a beginner's step to creating pieces that become more complex. When considering a silhouette pattern, avoid hard or coarse-grain veneer but select pieces that contrast each other to add to the pattern.

Hanger Tip

A hanger is made at a back of a marquetry picture by utilizing two little flush-slice metal plates screwed to the back of the picture, over an opening in which a bunch rests. A shoe lace goes between the metal plates, being secured by the knot, along these lines creating the holder. Two tips on this method. To start with, utilizing particle board for support, pre-drill (undersized) the opening for screwing the metal plate inlaid to the back. The motivation behind this tip is to decrease the propensity of a screw to constrain material in front of the tip, making an anomaly on the front surface. The second tip is to replace the knot in the gap by squirting epoxy into the opening and pushing the string's end into it until it is full. This is likewise a simple method for getting the right length instead of fiddling with the hitch's position.

Using Fret Saw or Knife

The thinner veneers are less demanding to cut with the knife and therefore propelled knife cutting procedures have advanced. The thicker veneers are easy to cut rapidly with a saw. Consequently the specialty has created along two unique ways. Lincoln (2014) says those utilizing the more thinner veneers as a part of Europe have both idealized both knife cutting and fret sawing as taught by the Marquetry society, and the individuals who have admittance essentially to the thicker veneers, utilize the fret sawing procedures taught by the Marquetry Society of America.

Straight lines are ordinarily cut with a knife, yet a bit troublesome when utilizing the saw. At times a straight edge of a ruler is utilized for beginning at the far point, and making little step cuts, working in reverse to the close point. The knife is normally vital for the stringers and cutting the backing board. Cutting scene, landscape and trees saw is used yet for structures and wall masks knife is likewise utilized.

Transferring Simple Patterns

Glue is applied to the back of the pattern and afterward joined to the veneer; traces of glue are cleaned from the veneer with lacquer thinners. Sometimes it's a considerable measure less demanding to draw a basic blueprint specifically onto the background veneer. A piece of transfer paper under the pattern traced with a sharp pencil or an old vacant ball-point pen. Pressed sufficiently hard to mark on the veneer, Basic office supply carbon paper would work yet transfer paper is preferred as it leaves wax-free lines which are easily removed.

Cutting Oval or Circular Borders

The shape and size of a desired oval is cut in veneer and a wide strip that is parallel to the grain of the veneer is also cut with a knife. So as to make an accent border with

the grain running at right points to the edge of oval, it is important to make a halfway oval from wedge-formed pieces of veneer. The quantity of wedges and their edges rely upon the shape and size of oval. Wide wedges can be utilized on the flattest parts of the oval and smaller wedges on the more tightly bend. The wedges are secured together with veneer tape on the underside.

Sand shading

Shading individual pieces of veneer adds an incredible sense of depth to the work. Dry sand is put in a pot; the pot is then placed on a plate and allows the sand to heat up. To determine the correct temperature, requires some experimentation. Scraps of veneer for the work are put into test by dipping each piece of veneer into the sand. The deeper of piece, the hotter the sand is. Therefore, the darker the shading will appear. If the sand is too hot the piece will tend to shrivel and crack. The correct temperature is to dunk the piece in the sand for a few seconds while manipulating its position. This movement gives a shade line that fades away, giving a better 3-D effect in the design.

4.6 Discussion of Results for Objective Two

What are the properties and characteristics of Ghanaian Indigenous Vegetable Tanned Leather that make it suitable for the manufacture of marquetry?

The data recorded indicates that leather can easily be stained but when the surface is coated with wax and lacquer, it will resist stains.

4.6.1 Leather Thickness Assessment Results

Table 4.5: leather thickness results

Parts of leather	Average thickness (mm)	
	After rubbing and skiving	After reinforcement
Butt	0.20mm – 0.25mm	-
Shoulder	0.20mm – 0.25mm	-
Back	0.20mm – 0.25mm	-
Side	-	0.20mm – 0.25mm
Belly	-	0.20mm – 0.25mm

(Source: assessment conducted by the researcher – August 2014)

The researcher found out that the parts of leather vary in thickness. Therefore, the thickest parts; Butt, Shoulder, Back were worked on by rubbing the flesh side of the leather with an abrasive paper and skived to reduce the thickness. The parts which were also thin; Side and Belly were reinforced with lining. These processes helped the researcher to acquire the average thickness ranging from 0.20mm – 0.25mm.

4.6.2 Results of Leather Pliability Assessment

Empirically, leather is believed to be a pliable material which can easily be manipulated to achieve its intended purpose. The researcher further treated the leathers by sanding, soaking and drying which enhanced their pliability.

4.6.3 Results of Leather Affinity for Dyes

The researcher found that leather can be dyed using natural dyes, suede dye and vat dye. But the common colours dyed by the local tanners are black, brown, red and cream which were purchased for the production of the marquetry.

Table 4.6 (A and B): Leather Stain Assessment Results

Leather	Category A	Result	Category B	Result
Red	Uncoated	Stained	Coated	Unstained
Black	Uncoated	Stained	Coated	Unstained
Brown	Uncoated	Stained	Coated	Unstained
Cream	Uncoated	Stained	Coated	Unstained

(Source: Assessment conducted by the researcher – August 2014)

All the four leathers which were uncoated (category A) were stained, whilst those coated (category B) with wax and lacquer were not stained. However, the researcher found out that to make leather resistance to stains, it must be coated either with wax or lacquer.

4.6.4 Results Assessment of Leather Hardness

The boiling method indicated that leather can be manipulated to achieve hardness for its intended purpose. The researcher also found out that sun drying, baking method and waxing can make leather hard.

In the light of the above stated result findings, Ghanaian Indigenous Vegetable tanned leather is a potential material for marquetry production.

4.7 Discussion of Results for Objective Three

To use leather as a potential material for marquetry in the production of selected living room furniture?

The centre and coffee tables produced were assessed for the following qualities;

1. Even Surface
2. Colour Pattern
3. Durability
4. Fitness for purpose

Even Surface

The surface of the centre and coffee tables were decorated with different coloured patterns of leathers inlaid with the average thickness between 0.20mm – 0.25mm on the wooden boards. The surfaces of the tables were burnished with smooth bottle to enhance the finishing treatment and also avoid peeling of the edges of the inlaid patterns.

Colour Pattern



Plate 54: (A and B): Colour pattern

The arrangement of the shapes follows a colour pattern which can be seen in the design. The patterns at one side of the design are reflected at the other side.

Durability

Testing for the durability of the leather marquetry was achieved in the course of the research. The surface was waxed and lacquered to resist any kind of scratches and stains. The edges were carefully glued to prevent shapes from peeling off from the background.

Fitness for Purpose

The centre and the coffee tables produced serve as objects used in the living room or in the offices whereby books, magazines, newspapers can be placed on it. The choice of colours and the whole frame of the work make it possible for the work to be functional and decorative which fits its intended purpose.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Overview

This final chapter provides a brief overview of the entire study, it has been categorised into four main sections. The first section deals with summary of the findings, the second section illustrates the conclusion drawn from the study, the third highlights the recommendation and the last presents references to theories.

Summary

The researcher was able to identify the different types of materials used for marquetry, their characteristics and the techniques used in their application. The research further unveiled that furniture makers are the most common craftsmen who produce marquetry products and that they are only familiar with the use of wood veneer, although other known materials such as metal, straw, horn, shell and mother of pearl are known to have been used for marquetry production. The research has revealed that there are two forms of marquetry; Pictorial and Applied Marquetry. The pictorial as the name indicates is for solely visual communication and the Applied is for visual and functional purposes as it is laid on a surface. The research also disclosed some major characteristics such as colour pattern, grain pattern, texture, even surface and aesthetic. The research has brought to the fore the different techniques and skills used for marquetry these include; inlaying technique, sliverisation, bevel knife cutting, bleaching wood, fret saw cutting, hanger tip, using fret saw or knife, transferring simple patterns and sand shading. The research has unveiled that achieving equal thickness of leather play a major role in the use of that material for marquetry production. The pliability of leather is also another important value in adopting it for marquetry work. Another important fact about the use of

leather for marquetry is its affinity for dyes; again the potentiality of leather to be hardened to different levels is also unveiled by the research.

The research has shown the potentials in using leather as a material for marquetry resulting in the achievement of even surface, use of colour pattern and fitness of purpose. The durability of the work was determined by the technical handling of leather through selection and application of appropriate secondary treatment processes, the resulting outcome provided a reliable applied marquetry product in form of two sets of centre tables with supporting coffee tables

Conclusions

The research revelations on the different types of materials used for marquetry provide basic motivation for the use of other available local materials. The information on the identified techniques also provides the opportunity for researchers to select a direction for their work. Finally, the two sets of finished centre tables with supporting coffee tables had the surfaces decorated with leather marquetry in applied form to demonstrate the practicability of using leather in furniture craft.

Recommendations

Marquetry materials for furniture must not be limited to the use of wood veneer. Ghanaian indigenous vegetable tanned leather which is locally available can equally be used to enhance its value in the Ghanaian society and by so doing create new employment opportunities. The research has unveiled the need to acquire equal thickness of leather for marquetry in the light of this, it is recommended that manufacturers of leather products should relate whatever item they produce to the thickness of leather they select in order to come out with more acceptable finished products.

Generally, the observation of the product marquetry is applied for the materials that can be used in marquetry works and techniques used in application of these materials only draw a common point that prospective craftsmen who practiced their vocation through the application of marquetry as a decorative technique should not limit themselves with one material, but do their best to diversify to other uses of materials in their vocation, this the researcher believes will always provide customers with alternate choices when they want to purchase items decorated with other materials.

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APPENDICES

INTERVIEW GUIDE 1

INTERVIEW GUIDE PREPARED FOR LEATHER TECHNOLOGISTS

OBJECTIVE: To acquire data on Ghanaian Indigenous Vegetable Tanned Leather.

1. Name.....
2. Sex.....
3. Age.....
4. Rank.....
5. Qualification.....
6. Working Experience.....
7. How is skin turned into leather?
8. What is Vegetable tanning and what type of tanning material commonly used for skins?
9. What are the properties and characteristic of Ghanaian Indigenous Vegetable Tanned leather?
10. What is vegetable tanned leather?
11. What kind of machines are in your workshop?
12. What are some of the items produced by your students?
13. How do you preserve student's leatherworks?
14. What do you know about marquetry technique?
15. Can Ghanaian indigenous vegetable tanned leather be used for marquetry?

INTERVIEW GUIDE 2

INTERVIEW GUIDE PREPARED FOR LEATHER ARTISANS

OBJECTIVE: To acquire data on the availability of Ghanaian Indigenous Vegetable Tanned Leather.

1. Name.....
2. Sex.....
3. Age.....
4. Rank.....
5. Qualification.....
6. Working Experience
7. Where do you buy your leathers from?
8. What types of animal pelts are mostly used for leather?
9. How long does it take you to get your raw materials?
10. How much does a sheet of leather cost?
11. How long have you been into this production?
12. Where do you get your leathers and how often do you get them for production?
13. What are the types of items you produce for sale?
14. Whom do you sell your products to?
15. How much do you sell your item?
16. What do you know about leather marquetry?

INTERVIEW GUIDE 3

INTERVIEW GUIDE PREPARED FOR WOOD TECHNOLOGISTS

OBJECTIVE: To acquire data on wood veneers and its processes.

1. Name.....
2. Sex.....
3. Age.....
4. Rank.....
5. Qualification.....
6. Working Experience
7. What is wood veneer and how is it processed?
8. What are the characteristics and properties of wood veneer?
9. How can wood veneer be preserved and the methods used?
10. What types of wood species are used for making veneers?
11. What techniques and tools do your students used in producing their work?
12. What kind of machines do have in your workshop?
13. What do know about marquetry?
14. What other materials can be used for marquetry technique?

INTERVIEW GUIDE 4

INTERVIEW GUIDE PREPARED FOR WOOD ARTISANS

OBJECTIVE: To acquire data on wood veneer and its availability and to acquire data on the techniques involved in wood veneer production.

1. Name.....
2. Sex.....
3. Age.....
4. Rank.....
5. Qualification.....
6. Working Experience
7. What are the names of wood veneer sold here?
8. Where do you get the source of wood veneer from?
9. Whom do you sell the wood veneer to and what do they use it for?
10. How much do you sell the wood veneers?
11. What are the tools and materials used for your production?
12. What are some of the veneer works you have produced?
13. What techniques do you implore in your works
14. What finishing treatments do you give to your works?
15. What type of wood veneer works do your customers mostly request for?
16. Why do you think veneer is mostly used for marquetry?
17. Apart from veneer what other materials do you use for marquetry?

OBSERVATION GUIDE

Objective: To observe the activities involved in furniture production.

1. Techniques involved in the use of wood veneer.
2. The tools and equipment used.
3. Workshop setup.
4. Type of work produced.