ASSESSMENT OF THE ADEQUACY AND UTILIZATION OF MATERIAL RESOURCES FOR INDIGENOUS METAL WORK ACTIVITIES IN KADUNA METROPOLIS.

BY

AMADI CHIDI BRIGHT

2007/1/ 27307BT

DEPARTMENT OF INDUSTRIAL AND TECHNOLOGY EDUCATION

FEDERL UNIVERSITY OF TECHNOLOGY, MINNA

OCTOBER, 2012.

ASSESSMENT OF THE ADEQUACY AND UTILIZATION OF MATERIAL RESOURCES FOR INDIGENOUS METAL WORK ACTIVITIES IN KADUNA METROPOLIS.

BY

AMADI CHIDI BRIGHT

2007/1/ 27307BT

A RESEARCH PROJECT SUBMITTED TO THE DEPARTMENT OF INDUSTRIAL AND TECHNOLOGY EDUCATION, FEDERL UNIVERSITY OF TECHNOLOGY, MINNA

IN PARTIAL FULFILMENT OF THE REQUIREMENTS OF THE AWARD OF BACHELOR OF TECHNOLOGY (B. TECH.) IN INDUSTRIAL AND TECHNOLOGY EDUCATION

OCTOBER, 2012.

CERTIFICATION

I, Amadi Chidi Bright, Matric No. 2007/1/27307BT an undergraduate student of the Industrial and Technology Education Departmentcertify that the work embodied in this project is original and has not been submitted in part or full for any other diploma or degree of this or any other university.

_____ _____

Name Sign/Date

APPROVAL PAGE

This project has been read and approved as meeting the requirement for the award of (B. Tech.) degree in Industrial and Technology Education of the department of Industrial and Technology Education, School of Science and Science Education, Federal university of technology, Minna.

---------- ----------

Supervisor Sign - Date

---------- ----------

Head of Department Sign - Date

---------- ----------

ExternalExaminer Sign - Date

DEDICATION

This research work is dedicated to almighty God, and my late brother Amadi Ikenna Eugene.

ACKNOWLEDGEMENTS

I wish to express my profound gratitude to God Almighty without whose provision, guidance and inspiration, this work would have been a failure.

My special thanks to my project supervisor Mr Emmanuel Raymond, in pursuance of this project from its inception to its final stage. And also with his indefatigable effort and dedication, provided me with all the necessary guidance I required to go through my work. You are really a "daddy". Special thanks to the department H. O. D Dr E. J. Ohize for the opportunity given to me to study in this department. Still want to thank all the departmental lecturers, God bless you all.

I do acknowledge my friends Udoh James Anietie, Omoke David O., Suleiman Haruna, Ike TochukwuIfeanyi, MuhammedYakub and others who have contributed in one way or the other to the success of this project.

My sincere gratitude goes to the family of Mr Anthony Amaefule for accommodating me during my early days in the university. May the Lord bless you and your family.

My sincere gratitude to my parents Mr Eugene Nzelogu and Mrs Stella Amadi who have tremendously contributed financially and morally to the successful completion of this programme, I pray that God almighty will reward your efforts in hundred folds. Worth mentioning are my beloved brothers and Sisters, justice Amadi, Franklin Nzelogu, late Ikenna Amadi, Amarachi Amadi and EzenwaIjeoma Linda who were all sources of encouragement to me. God bless you all in all your endeavours.

Lastly, I acknowledge all those people whose names do not appear here but have in any form or means contributed to the success of my ambition. I thank you all for being part of my academic pursuit. I shall live to remember you all.

TABLE OF CONTENTS

CHAPTER II

LITERATURE REVIEW

CHAPTER III

METHODOLOGY

CHAPTER IV

PRESENTATION AND ANALYSIS OF DATA

CHAPTER V

SUMMARY, CONCLUSIONS AND RECOMMENDTIONS

LIST OF TABLES

Abstract

The study was specifically designed for the assessment of the adequacy and utilization of material resources for indigenous metal work activities in Kaduna metropolis. Four research questions were designed to guide the study. The literature was reviewed in 6 sub-headings and summarized. The research methodology which includes research design that employed a descriptive survey of Kaduna metropolis, designed to assess the adequacy and utilization of material resources for indigenous metal work activities as the area of study, 50 respondents were derived of which 30 are indigenous metal workers and 20 technical teachers. The instrument for data collection was a well-structured questionnaire of 50 items. The data collected were analysed using statistical tools to determine the hypothesis responses and the findings discussed. It was found that metallic scraps from industries are used for making farm tools and aluminium scraps are used for casting of pots. Finally, the study was summarized and implications were stated, the study was concluded and recommendations were made that short term courses in the local language should be used to up-date the master craftsman's knowledge and there should be establishment of industries for the development of basic raw materials such as ferrous and non-ferrous metals.

CHAPTER 1

INTRODUCTION

Background of the study:

Technology according to Microsoft Encarta Encyclopaedia (2009) is a general term for the processes by which human beings fashion tools and machines to increase their control and understanding of the environment. The term is derived from the Greek words tekhnē, which refers to an art or craft, and logia, meaning an area of study; thus, technology means, literally, the study, or science, of crafting. Aliyu (1997) defined technology as the study and utilization of manufacturing and industrial methods. It is used to harness the forces of nature and transform the resources that nature has bestowed on man, into goods and services for better quality of life. According to Titanyi (1985), 'science and technology represent power instruments of change which can assist in the economic, social, and cultural development of people' such that the superiority of the rich countries in terms of their living standards, better health services and educational facilities is generally attributed to the breath taking advances in science and technology which has taken place in the industrialized countries during the last two hundred years. Olaoye (2008) interprets technology to meanthe transformation of a theoretical idea to apractical skill in order to produce the objects ofone's need.

To this end, series of meetings, conferences, seminars, and workshops have been organized and held on the indigenous production and the advancement of iron tools in Nigeria and Africa at large. Such goods and services range from power generation to military weaponry, from food preservation to housing, and to every other human needs and activities. Indeed, the wealth, political influence and economic strength of any nation depend on the nation's capacity to harness technology for socio-economic development. Every society has its own technology and can evolve and develop new technologies appropriate to its needs. Technological changes in society can take the form of removing constraints, creating new

opportunities and altering the productive systems of the country. Technology can be obtained by either developing it internally using local resources and skill or acquiring it from an already existing source. The former is called indigenous technology while the later is referred to as imported or transferred technology. Technology as variously used does not mean machines alone. Technology could involve a combination of ideas, methods and machines, all developed mostly through research. Adoption of technology is a function of scale of production, economics of scale, skill of labour, costs and its availability, level of knowledge of available technology and level of available technology. Technology is central to manufacturing and consequently to an economy.

Traditional skills and techniques can be summed in what is usually referred to as Indigenous Technology. Indigenous technology involves the application of local method in the production of goods and services. It is so called because in most cases the raw materials, tools, skills and techniques are locally available. There is enough evidence that indigenous industries thrive before western products were deliberately brought in to kill their development and expansion.

Technology is also critical to the development and utilization of local resources endowment. Nigeria's manufacturing industry has been highly dependent on foreign equipment and machinery partly due to technological backwardness and the past industrialization policies of government (particularly import substitution), that further encourages dependence on imported raw materials. The essence of application of technology in any business is as to increase the productivity per labour and income. The technology input should be able to sustain business profitability. These give reasons for a careful consideration of the choice of technology input to ensure profitability of the enterprises. Thus, investment in technology cannot be viewed as a mere grandiose display of wealth or expertise but as a functional economic necessity.

Metal working according to Wikipedia is the process of working with metals to create individual parts, assemblies, or large scale structures. It includes a correspondingly wide range of skills, processes and tools. Metalworking has evolved from the discovery of smelting various ores, producing malleable and ductile metals useful for tools and adornments. No one knows with any certainty where or when metal working began. The earliest technologies were impermanent and were unlikely to leave evidence for long.

The advancement that brought metal into focus was the connection of fire and metal. Who accomplished this is unknown as the when and where, but the Egyptians are thought to be one of the first civilization to work on gold. Metal working as a creativity outlet in the form of jewellery making, blacksmithing, tinsmithing`, tinkering, welding and other art pursuits.

Virtually every Nigeria community knew one thing or the other about Iron technology in the aspect of identification of the Iron ore, extraction of deposition, crushing and smelting of metal and forging the metal into various tools. The Blacksmiths played significant role in that they produced materials of need such as weapons (spear, Arrow, guns, etc.), Agricultural tools (hoe, cutlass, shovels etc..) jewellery (ear-rings, rings, trinkets, pendants and necklace), Kitchen equipment (pot, store, spoon, etc.) and others that are for domestic use such as stood, Iron chair, Knives, table etc. In the area of Agriculture, Blacksmith are able to improve and manufacture farm implement such as hoe, cutlasses, Axe, etc. This is a significant land mark in the history of Agriculture technology in Kaduna and Nigeria as a whole in the sense that the tools so manufactured replaced the wooden and stone tools, which were used by the early man.

Weapon of war were another product of Blacksmith. Weapons like Dane guns, Arrows and Bows are produced for defence against internal and external aggression, it was the availability of this weapons that made African communities and Nigeria in particular to

be able to resist the British force, and the use of this weapons was no doubt an epitome of indigenous technology in military hard wares in Nigeria.

Chisels, Blades, Dagger, and Hermes were also product of Blacksmith in Kaduna, these products were needed for wood carving, and as a result the Blacksmith stimulated another craft of the indigenous technology because carving is also another important skill among Kaduna community.

Home utensils and catteries like spoon knives were also product from Blacksmith. There is the production of metal pots of various sizes and shapes for domestic and commercial uses and also during festival. The provision of these tools had made life relatively easy for the people of Kaduna because the existence of these basic tools.

Earring, Necklace and bangles are other products from blacksmithing; these products are of great domestic value they were mostly used by, rich and noble people, braid or a celebrity.

The intricate techniques in which metal pieces discuss were produced and the apparent virtuosity of the artist further suggests the existence of technology which was adequate for the people of Kaduna. It is still unfortunate that the technology which produced these objects are still competing with the western technology and modernization, Kaduna can still boost with the existence of materials produced by indigenous metal work technology.

A survey literature of the Economic Conditions in Nigeria's Minerals production has revealed that the country is endowed with vast mineral resources that could form a solid framework for gigantic metal industries that are needed in the country (Abraham, 2007). Among the mineral potentials mentioned are bauxite, diamond, and iron ore, all of which are deposited at Kebbi with an estimated reserve of two billion metric tons. Other, smaller deposits of these minerals are found between Enugu and Nsukka. In addition, lead and zinc are found in the Abakalike area, and about five to eight billion metric tons of limestone is

located in Kankara Katsina State (Ziya, 2008). The different iron and steel complexes in Ajaokuta and Warri, and the steel rolling mills of Katsina and Jos, are remarkable worthwhile industrial programs (FMMP, 1981). Also, it has been shown that the main burden of industrial development in Nigeria remains with the private sector, which has not had the financial resources in the past years. According to a publication by Davis on Nigeria's option for long-term development, it is very important that the local manufacturers are industrialized (Davis, 1990).Waste-picking and informal sector recycling generally takes place in various settings and involves a wide range of interconnected actors. The story of solid waste management in Kaduna is a familiar one. There is no formal waste sorting or recycling; not all the waste produced is collected; and waste is disposed of in open dumps and even illegally in public spaces. The bulk of the material found comprising mainly metal, paper, plastic and glass. The household is a major source of waste. An informal waste-sorting system has emerged largely through the activities of itinerant waste-pickers, known locally as mai kwalabe, whose main area of operation is high-density low-income areas. Mai kwalabe is a Hausa word meaning someone who deals in bottles. While old bottles used to be the only material collected, the business has expanded to include items such as second-hand shoes, iron bars, steel, special metal, caterpillar, aluminium cooking pots and other materials. Waste-pickers are the link between generators of waste and middlemen, while middlemen link waste-pickers to the final end-users majorly the local artisans.

Statement of the problem:

Indigenous metal work technology has been an integral part of national development strategies in many societies because of its impact on productivity, economic growth as well as in human resource development. The development of indigenous metal work technology base of Kaduna metropolis has been the responsibility of the individuals who partake in the trade.

The problems of being able to understand that there are modern ways and machines available for the production of locally made metal items by the indigenous metal workers, the belief that the skills and materials used by the indigenous metal workers is said to be inadequate in welding, fabrication, blacksmithing and other forms of metal works in Kaduna metropolis. The problems of accessibility to available materials by the indigenous metal workers, the tools they use and the products produced are causes for concern.

Base on this above statement, this study seek to assess the adequacy of material resources for indigenous metal work technology, determine possible items that could be produced by these local craftsmen and ways in which these issues can be addressed in Kaduna metropolis.

Purpose of study:

The purpose of this study is to provide detailed knowledge of metal work activities in Kaduna metropolis.

Specifically this study will find out the following:

1. The adequacy of materials resources for indigenous metal work activities in Kaduna metropolis.
2. The extent of utilization of available material resources for indigenous metal work activities.
3. Challenges associated with the indigenous metal work activities in Kaduna metropolis.
4. Ways of reducing challenges of indigenous metal work activities.

Significance of the study:

This study when successfully completed will be a guide to indigenous metal workers particularly in the use of available material resources in the cause of their work activities as well as in identifying of the various items that can be produced from the available materials. It will help curb the importation of similar products that are produce locally by the indigenous metal workers there by increasing the market for indigenous metal workers. It will

help them to identify their major problems in the process of carrying out their activities. It will help increase their performance level in the area of their trade. It will also help indigenous metal workers and those who want to venture into this trade in the availability, purchase and utilization of metallic materials in Kaduna metropolis.

The existence of indigenous industries over the centuries in Nigeria is quite significant for study and history of Nigeria. The significance of this study is to illustrates, the interdependence that existed and encouraged the movement of people, goods and ideas from North to south, east to west and vice versa. This effort is undertaken because; the indigenous techniques of production of Iron smiting, forging and other forms of metal working in traditional societies have virtually atrophied due to neglect and disdain. The situation is born out of the fact that their position has been overshadowed by the importation of foreign goods and Equipment.

Furthermore, the significance of the study is to show or draw attention to a neglected aspect of Nigeria history. By studying indigenous industries, we can now appreciate the place and importance of the masses who helped to bring great men into lime light and who helped to provide strong economic bases (sometimes through their crafts) that support the various governments. Thus, individuals, bodies and groups are to recognized indigenous traditional values and harness them into a sound base for technological take off and for Nation building. The study will also help in the employment opportunities which are also a problem facing Nigeria and Kaduna metropolis in particular.

Scope of the study:

This study is limited to material resources for indigenous metal work activities such as blacksmithing, welding, fabrications and casting. It is also restricted to indigenous metal work in Kaduna metropolis.

Assumption of the study:

It is assumed that the response from the local metalworkers will help to provide valid information or any improved techniques in the improvement of indigenous metal work technology.

Research questions:

The following questions were formulated to guide the study:

1. How adequate are the materials resources for indigenous metal work activities in Kaduna metropolis?
2. What is the extent of utilization of available material resources for indigenous metal work activities?
3. What are the ways of reducing challenges of indigenous metal work activities?
4. What are the challenges associated with the indigenous metal work activities in Kaduna metropolis.

Hypothesis

The following null hypotheses were tested at 0.05 level of significance.

Ho1: There is no significant difference between the mean responses of the technical teachers and the indigenous metal workers in Kaduna metropolis on the adequacy of materials resources for indigenous metal work activities.

Ho2: There is no significant difference between the mean responses of the technical teachers and the indigenous metal workers in Kaduna metropolis on the extent of utilization of available material resources for indigenous metal work activities.

CHAPTER II

LITERATURE REVIEW:

This chapter examines the related literature in the development of indigenous metal work technology in Kaduna metropolis.

1. Concept of indigenous metal work activities.
2. History and development of indigenous metal works in Nigeria.
3. Need for assessing indigenous material resources on indigenous metal work activities.
4. Influence of adequate material resources on indigenous metal work activities.
5. Utilization of metallic material resources for the production of metallic equipment.
6. Goals and training methods of indigenous metal work technology in Nigeria.
7. Summary of literature review.

Concept of indigenous metal work activities

Since the development of civilization, people continually discover ways to complete tasks. In our drive to survive, we, as humans, have developed several objects that help to make life easier. More complex objects include computers, telephones and automobiles. Simple tools include forks, screw drivers and spanners. All of these objects are made out of some type of metal. The development of metal and the art of forming metal have come a long way over the years.

Prior to the discovery of metal, people used simple tools made out of bone and wood. Soon, however, fire was discovered and eventually ancient humans discovered that adding heat to certain rocks, more accurately described as ores, could free the metal from the rock. With the discovery of fire, eventually evolved the art of extracting and smelting metals, and forming them into usable objects. Such a practice is commonly referred to as metal working.

The development of mass production replaced the traditional blacksmith's most important function. Gone was the dependence on him to supply the tools needed for

civilization and war. During early historical periods, precious metals had value attached to them. Metalworkers, therefore, used the metal to make religious artefacts, jewellery, keepsake items, tools for specific trades and weapons. Metals were formed by artisans, blacksmiths, atharvavedic practitioners, and alchemists. These metalworkers became increasingly important as time passed and metal became more necessary.

Metalworkers were considered to be very valuable members of early societies. As more and more items and tools began to be made out of metals, more people were needed who were skilled in the craft of metal working. These so called metal smiths were important for maintaining the economic stability of a civilization. Objects made out of metal were necessary for industry, farming, jewellery making and defence purposes. The necessity of metal items contributed to making the metalworker an invaluable member of society.

Today, the art of working with metal provides several occupations and trades. Many people specialize in forming and shaping metal. Techniques have definitely changed since ancient times and much of the forming of metal is done by machines. For example, the technique of roll forming is completed by using quality roll forming equipment.

It is believed that originally metal was derived from meteorites, which were considered sacred; therefore very special objects were made from it. However, it was gradually discovered that metals could be obtained from below the earth’s surface. Working with metals appeared to be veiled in mystery and connected with the occult; the smelting and shaping of metal was a secret ritual and the blacksmith's forge was considered sacred. The blacksmith was seen as a visionary, who could fashion artistic as well as useful objects out of the most unlikely and inflexible of substances. Later, metals were associated with the planets and it was believed that their use could accentuate or minimize planetary influences.

This mystique was transformed into the science of alchemy. As a result of their ability of working with metals, the ancient civilizations gave the master workers predominance over those who lacked these skills.

Over the years, the availability of metals grew and vessels of diverse shapes were developed for different purposes; many of the shapes being derived from nature.

The idea that art of metal work was derived from political situations of the country is from France and Anglo-America. They began to appreciate the art as it was a source of lively hood and in production of weaponry.

The contention of indigenous development of iron working technologies in West Africa stands in opposition to earlier "diffusion" accounts. For example, Davies (1967) argued that iron was discovered after many centuries of the use of copper and bronze. According to him, the knowledge of iron smelting is a very complicated one, and smelting was at least partly worked out in Eastern Anatolia around 1,500 B.C.E. The knowledge of iron working diffused through the Near East and Europe with the weakening of the Hittite state. He further argues that the knowledge was brought to West Africa across the Sahara from the Maghreb. Confronted with evidence at Ntereso in Ghana, Davies asserted that a limited knowledge of iron working may have reached parts of West Africa quite early (Davies 1967; Willet 1971).

The concept of indigenous metal work activities in Africa were born of culture and nature, Childs &Killick (2001). Studies of African metal works can, therefore, shed light on beliefs as remote from the forge and the crucible as marital relations, witchcraft, and the obligations of the living to their ancestors. Several direct or indirect economic functions of African metals have been recognized and explored to varying degrees, example are in agricultural production, warfare, trade over varying distances, currency with values set for specialized or general purposes, and a means of storing wealth. There has remarkably been

study of agricultural tools and weapons of metal in Africa. Much more attention has been paid to metals as items of trade, particularly in relation to the rise of African states.

Metal objects also functioned in rituals to benefit the society and the state. The new moon ceremony of monthly renewal in some parts of eastern Africa required the focus upon studies of the social significance of African metal work. We first summarize the changing role of metal work through time in prehistoric and historic sub-Saharan Africa. Next, we look at ethnographic studies that examine how metallurgical technologies were understood, and the natural and supernatural forces that influenced these processes. We then review what is known of the social organization of metal production in historical times, and the social roles that metals played in selected African societies.

Only in southern Africa is it still plausible to see iron technology arriving as part of a "package" with cereal agriculture, and permanent architecture. The knowledge of smelting was apparently never acquired by the pastoralists and hunter-gatherers of southern Africa, although they did forge traded metals. In the Central African woodlands, stone-using hunter-gatherers coexisted with iron-using farmers within the last five centuries.

The dimensions of gender and age were sometimes made explicit in Africa metalworking, although it was more often expressed subtly in ritual, dance, and song.

The rise of African states resulted in increased demand for symbols of prestige and power, among which copper, iron, and gold were prominent. The greater yield of this furnace provided the king with more iron and greater profits from trade in the iron. Metalworkers were also employed full-time. In so many communities, ironworkers worked in three month shifts each year at the royal court and had to meet production quotas in exchange for certain privileges. Similarly, the hereditary guilds of brass casters worked exclusively for the royal court of Benin and enjoyed special privileges. After a metal is won from ore, it is given social roles that may change during its lifetime. An iron hoe, for example, may have multiple uses

and meanings, depending on the context of its use, whether as an agricultural tool, a currency, a burial offering, bride wealth or dowry, or political regalia. A gold nugget, quite apart from its potential economic value, might be sought as a protective talisman. African art or artefacts cannot be understood without reference to their exact social context. This explains why historians of African art have almost unanimously rejected the aesthetic approaches that dominate Western art history. The artefacts are interpreted as material expressions of ethnicity, status, religious affiliation, and wealth, the meaning of which is constantly manipulated and negotiated.

Three aspects of metals made them particularly useful for symbolic expression. First, copper and gold were rare and expensive, and therefore, were useful for conspicuous display of wealth or high status. Secondly, the mysterious transformation from ore to, metal usually likened to the human processes of gestation and birth, undoubtedly made metals especially appropriate symbols of fertility and productivity. Third, the physical properties of metals—colour, luminosity, malleability, and storability—greatly influenced their functional and symbolic potentials. The complex histories of iron and copper currencies have also been researched in some detail. De Maret argued that some forged iron objects were used in Zaire's distant past for specialized purposes, such as bride wealth. Copper ingots then replaced iron as special purpose currencies when social differentiation developed in Central Africa from the tenth century AD. The copper ingots were made smaller and more standardized through time, possibly reflecting a change from special to general purpose currency. Guyer found an increase through time in the number of iron currencies and a decrease in their craftsmanship in Cameroon, but relates these trends to active negotiations and changes in the local politics of marriage. The replacement of iron currency by copper may have resulted from the relative ease with which copper could be cast into standardized forms. Herbert suggests that the introduction of currencies for marriage payments, first in iron, then in copper, also had

symbolic associations a material produced through the fertile success of a furnace was used to appropriate the fertility of women. Herbert also suggests that the change in metal did not involve an ideological conflict because copper was equally or more scarce, durable, and storable as iron, and its production was often attributed to a fertile furnace.

A common use of metal objects in many societies is to mark major changes in a person's life cycle. Age and gender were often critical determinants regarding the type, form, and number of objects used. During the history, for example, some societies use elaborate iron jewellery at the naming ceremony of a new born to symbolize the connections to the infant's ancestors, as well as familial continuity through rebirth. Young women in some areas receive or remove metal jewellery, particularly of copper, at first menses, marriage, or the birth of a child, probably because of its symbolic correspondence to fertility. Among the Loikop of Kenya, the age grade and ethnic affiliation of a man can be read quickly from the shape of his spear. Special objects of metal were sometimes buried with the deceased, as in the Upemba Depression of Zaire in the first millennium AD. The most dramatic examples of such life changes were the investiture ceremonies of some African rulers, as mortals were transformed into divine beings. Metal objects such as elaborate axes, anvils, and spears were used as insignia of office to symbolize and legitimate the new authority. More significantly, some items embodied the ancestral spirits who protected and gave power to the leader. Other social roles were also symbolized and legitimated by metal objects. Special axes, spears, or jewellery were used by spirit mediums, powerful men in various occupations, or high-ranking members of secret or specialized societies. Metal bells and drums were often required to activate the spirits who empowered leaders, or to accompany the praise of leaders.

Metal objects played other roles in African political arenas, besides embodying divine power. Political leaders, such as the Oba of Benin, commissioned bronze plaques and portrait heads of themselves to immortalize their achievements. Gifts of precious metals were also

used by rulers to build and maintain alliances, as well as to designate regional chiefs as local agents of authority.

Metal objects were also used by rulers of West African states for the expansion and defense of their various territories and kingdoms. For instance, according to Akinjogbin (2004) iron was a decisive war implement by Emperor Oduduwa to entrench his power over Yoruba land. In addition, there is substantial evidence that in various parts of West Africa such as Yoruba land, Kanuri land, Igbo land (all in Nigeria) and Boboland (Burkina Faso) that metal objects were used for ritual purposes. For example, in Benin City different types of figurines were cast and put in royal ancestral shrines (Okpoko 1987). Iron not only impacted political and ideological orders, but also enhanced agricultural production, which ultimately led to rapid population growth in Yoruba land. In the sphere of agriculture, there was tremendous improvement with the use of metal implements. For example, cutlasses and hoes made of iron allowed for more effective cultivation of greater expanses of terrain.

The history and development of indigenous metal work technology in Nigeria

The origins of the technology culture are very pre-colonial in setting. Indigenous metal work technology has responded to the needs of the Nigeria societies long before the era of modern technology. Today that technology still exist among several communities who have been practicing this type of metal work technology and is equally utilized to serve the needs of the people. Although not much has been written on the history of indigenous metal work technology of the pre-colonial Nigeria societies, yet there is enough evidence to belief that indigenous metal work technology grew up with these peoples in those communities and became part and parcel of their culture. It was from this antiquated technology that the present structure was built Garba (1990).

Mining is one of the oldest economic activities in Nigeria, with evidence of iron working civilization around Nok area in Kaduna state from 340BC, archaeologist have found

iron spears and, iron smelting furnaces have been found at Taruga in the same area. Some 1,000 years ago, the Golden lands of Wangara in the Hausa kingdom were famous for their gold. Ife and Benin bronze works flourished in the 13th and 17th centuries respectively. Benin, Kano and Awka are known in blacksmithing while Ilorin combines gold and blacksmithing activities Garba (1990).

With the knowledge of iron ore smelting, it became possible to make farm implements for improved agriculture. The tools in various ways helped to improve the quality of life of the individual and the whole people.

The importance of blacksmithing to agricultural welfare and other domestic uses cannot be over emphasized. As buttressed by Garba (1990) the blacksmith for instance, manufactures hand tools for land clearing, rigging, bed making, planting, weeding as well as harvesting would be as significant land mark in the history of agriculture technology in Nigeria, in the sense that the tools manufactured by the blacksmith replaces the wooden and stone tools previously used before the coming of blacksmithing.

The history and development of indigenous metal works activities in Nigeria can be traced back to the people of the nok culture, Igbo Ukwu and in the Benin kingdom.

Awka indigenous technology (the Uzu culture) revolves around blacksmithing / metal work. The Uzu culture originated as blacksmithing. It was and still is a guild, a highly professional society with religious attachments and highly respected. The magnitude of the reverence for the Uzu culture can be seen in both past and present customs and traditions. Firstly the blacksmiths instruments were revered and could not be touched by non-blacksmiths, except their apprentices. Secondly these tools could not be stepped over by women in their monthly cycle. Violations required rituals of cleansing which could be quite expensive for individuals at the time. Thirdly the modern day traditional head of the Awka community is referred to as EZE-Uzu, literally ‘the technology / blacksmith king’. The term

could also be described as ‘king of the people who are predominantly technologists / blacksmiths / metal workers’. Moreover there is a yearly community wide blacksmith festival from the beginnings of the Uzu culture which still holds today.

The origins of the technology culture are very pre-colonial in setting. The earliest records of the Uzu culture in oral tradition locate the civilisation as ancient technology culture mixed with religious worship. Oral history holds that the Uzu originated from the Ezeagu area in present day Enugu State of Nigeria, specifically the Agulu Umanaa community. This area had iron ore deposits in both large and small sizes. The Uzu technology first developed in Agulu Umanaa and through transfer spread downwards to Agulu Awka; and from there to Awka mainland. The technology grew more rapidly in the Awka area due to a larger section of the local population developing interest, at the time.

In ancient times and basically the pre-colonial era, the Ezeagu area dictated the pace of the Uzu technology development; being the initial source of raw materials. Awka took over prominence, generally within the ending period of the pre-colonial era. During the colonial period, the Uzu Awka culture had become the more prominent; with an increase in the supply of metals and mastery of the art and craft of blacksmithing. The materials came from iron fasteners of oil barrels called ‘ponnies’, rail track slippers and supply pipes. Early in the beginning of the post-colonial times, the Uzu technology of Awka was clearly the leading culture. This was enhanced by the coming into existence of regular supply lines for sheet metal and iron rods.

The study of iron smelting in the nok zone was principally centred on Taruga, which is too far in the core nok culture area. Iron smelting survives in the form of iron smelting. B. E. B. Fagg in 1943, at the site of Taruga, stated that the nok culture area has become the focus of iron-smelting in West Africa and indeed Nigeria. Anozie (1979) and Okafor (1984)

stated that iron working was practiced all over Africa and in the savannah land of the northern Nigeria precisely in the nok area.

The use of Iron and development of its technology in Benin Kingdom has had influence in the state – building process. Iron technology led to the development of weapons which change the character of war. Generally, in West Africa, the state that rose to power in the period between 1400 and 1700 AD such as Benin, Nupe, Igalla, and Oyo in the present day Nigeria, dominated others part because of the advantages in the development of Iron technology. Rich iron ore deposits were not available in Benin and had to be imported from the Etsako area-north of Benin which had large deposits. Benin was able to develop an indigenous capacity to work the iron material into weapons of war. It is probable that this indigenous capacity which was basically the possession of iron smelting knowledge was acquired though training and apprenticeship of Benin Black smith in Etsako. By the 2nd half of the 15th century when expanded its empire virtually in all directions, established control over the iron ore sources which was considered to be essential to the development of Iron technology in the state. This primarily explains the usefulness of the Iron smith in setting a peace for the other guilds that collectively form the guilds system in pre-colonial Benin.

Need for assessing indigenous metal works activities in Nigeria

The major effect of legitimate trade introduced by the European to replace slave trade is to make the colonies dumping ground for European industrial goods. In effect it filled the skill and initiative of the countries and made them dependant or foreign goods. Europeans manufactured goods like sophisticated weapons, metal ware, textile products and consumer goods were imported into African which not only change the taste of the African consumers but also brought out of market all competing indigenous products.

The indigenous metal work activities in Nigeria suffered serious setback as a result of indiscriminate importation of European metal products, ObaghoEhinonbhenLoveth (2011).

This is because not only are the imported substitute of its products cheaper, it drastically reduced demand for them. What is now left is the production of some cooking utensils and agricultural implement likes hoe, cutlass, sickle and others which are still being use by farmers' majority of whom cannot afford mechanized techniques and equipment for farming.

The effect of this indiscrimination importation of European metal items was that it discouraged development of skill by the indigenous iron workers. This situation according to Rodney is technological Arrest' or stagnation and in some cases actual regression, since people become dependent on already made imported goods. They are in most cases less durable than the traditional metal products. The unrestricted importation of European metal goods also made many people forget the traditional techniques which our fore fathers used in iron smelting and smiting. Iron working is on the decline because of the introduction of specialized craftsmen as mechanics who repair cars, motorcycles and bicycles which are used on roads. The economic viability of the blacksmiths have become a thing of the past because of the importation of the Europeans metal products like knives, cutlasses steel pots and weapons which are not only cheaper but more attractive, although some of them are less durable, but it has succeeded in crushing the native industry and killing the initiative of the indigenous craftsmen.

Many products of the indigenous metal work products have found one substitute or the other from European imported goods. The effect is that it further shifted the demand from locally produced to the foreign ones and this gradually reduced the number of blacksmiths and other forms of metal work activities found in Nigeria. For instance locally made fore for cooking (Erun) is now replaced by importation of stores, electric and gas cookers of different types also traditional weapons of war and hunting have been replaced by modern and more sophisticated European weaponry. Iron pot cooking utensils and other locally produced are

now being replaced by Europeans imported stainless, steel pots, plate and other kitchen and table sets.

In the realm of fundamental products, the iron worker pots, cups, spoons and other fundamental cooking utensils have found replacement in imported metal products.

Inclusively, introduction of vocational trading centres like the National directorate of employment all over Nigeria, contributed in a great deal to shifting away interest from indigenous metal work activities in Nigeria.

Influence of adequate material resources on indigenous metal work activities

Indigenous metal workers depend largely on used metal scrap materials of either imported materials or raw materials for industrial use. As so many communities who were engaged in the mining of iron ore no longer take the trade serious as so many young adult who supposed to inherit it on serve as apprentice to their masters no go about to look for white collar job. This has made raw material inadequate as the few who are still on this trade can hardly afford to buy materials form those who import same metal raw materials. They prefer to buy used or scrap material from local industries or from scrap pickers.

Resource consumption in the world is rising rapidly, driven by population growth and rising wealth. Projections suggest the global economy may grow fivefold in the next thirty years to meet the aspirations of developing countries (World Resources Institute, 2001) but there is real doubt as to whether the earth has the capacity to support continuously escalating levels of resource extraction and disposal.

Traditionally, recycling of solid waste in Nigeria revolves around the activities of human scavengers. In local parlance (particularly in northern and central Nigeria), they are referred to as 'Yan Bola' (*Hausa, plural*: guardians of the garbage), 'Yan Panteka' (*Hausa, plural*: motor scrap cannibals), 'Yan Gwangwani' '(*Hausa,plural*: metal scrap collectors), 'Yan Makera' (*Hausa, plural*: metal fabricators/smiths) or ''Yan Tinka' (*Hausa, plural*: tin boys).

In the past, they collect scraps (metal, rubber, paper and paperboard, glass, leather, textiles and wood) from the garbage bins and government dump sites, construction sites, mechanics garages, markets and factories to recycle them into household and industrial products. Recently, with increasing demand for scrap materials from local iron and steel companies, plastics manufacturers, and importers from Asia and Latin America, the tempo, scope and frontiers of the recycling business in Nigeria have been extended in the last two decades. As a matter of fact, the business has now become a well-organized chain, stretching from the activities of scrap collectors to those of an indigenous emerging class of entrepreneurs acting as middlemen, as well as end users (scrap product retailers, metal smiths, local and foreign fabricators and manufacturers, and so on).

Utilization of metallic material resources for the production of metallic equipment

The history of metal has been declared the history of civilization. It would be almost impossible to overestimate the importance of metal to man. Various articles of daily life are made from metals, metal is life. Metals are commercially used for manufacture of ships, aeroplanes, motor cars and various industrial machines. Iron bars are used in the construction of buildings. Metal wires of pure copper and aluminium are used for the supply of electricity. Lead is used for water pipes. Aluminium is used in alloys for manufacturing of different parts of ships and aeroplanes and different heavy machinery.

Metal working has helped engineer the modern age. With the availability of metal parts for electronics and airplanes, machining has made the realization of sophisticated technological advances possible and these advances have benefited human kind and have allowed us to travel to the moon and beyond. With the invention of the computer, metal working has helped us modernize all aspects of our daily life and has helped us advance medicine to increase our life expectancy. Metal working in all of its forms, from steel production to aluminium machining, is a multi-billion dollar industry. From small machine

shops to huge warehouses where parts that weigh tons are machined, metal working has evolved from simple jewellery making for the pharaohs of Egypt to technology that carried astronauts into space. As computer technology advances, so will current metal-working techniques. Home metal working, which was once thought impossible, now allows hobbyists to create sophisticated metal parts in their own workshops.

Tools are things used to make works or tasks easier. Tools have changed over time. The first tools were made in the Stone Age and Bronze Age. Through history, people have many new and more complicated tools by the use of metals. Some examples of tools that are often used today are hammers, the wrench (also called a spanner), saws, pliers are made of metals, some parts of telephones and computers are made of metals.

Metals have been very important in human history and civilization. In the production of cutlery, which is a hand implement used in preparing, serving and especially eating food in western world. Knife, fork, and spoon are the major cutlery of the western word are all been produced from metal. In transportation metal has enabled man and goods to move from one place to another. Pipes are useful for transporting water for drinking or irrigation over long distances when it needs to move over hills, or where canals or channels are poor. Oil pipes are made from steel or tubes for the transportation of petroleum products. In automobile construction, metal is used in the construction of the body. Trains and railways are constructed from metallic materials. Metals have been a major raw material for construction of much metallic equipment. From ship building to boat building, metal is used for their construction. Machine tool parts are mainly made of metals. Machines are used in the industries for product of various items. Machines such as lathe, drilling, milling, cutting machines are made of metals.

Goals and training methods of indigenous metal work technology in Nigeria

Indigenous African education and knowledge has generally been understood as a simplistic process of socialization involving the preparation of children for work in the home, the village and within a select ethnic domain. Thus, most contemporary discussions on indigenous African education rest in the shadow of Western globalization ideas about structural adjustment, etc.; and congruently it is projected as a stagnant, limited, and inoperative paradigm which pushes some to conclude that any serious discussion about the indigenous transmission of values and its accumulated knowledge in Africa is a waste of time. However, via an African centred synthesis one can begin to appreciate the particulars of indigenous ways of knowing and their epistemologies. For example, in examining indigenous African education and knowledge closely, we see that it involves understanding education as: a means to an end; social responsibility; spiral and moral values; participation in ceremonies, rituals; imitation; recitation; demonstration; sport; epic; poetry; reasoning; riddles; praise; songs; story-telling; proverbs, folktales; word games; puzzles; tongue-twisters; dance; music; plant biology; environmental education, and other education centred activity that can be acknowledged and examined.

In all African societies, the purpose of indigenous metal work education was clear functionalism was the main guiding principles Nigeria society regarded indigenous metal work technology as an end in itself. Education was general for an immediate induction into the society and a preparation for adult hood (Fafunwa).

The description of Fafunwa (1974) reveals that indigenous education emphasis social responsibility, job orientation, political participation and spiritual values. In indigenous education, children learn by doing, which is to say the children or adolescent were engaged in participative education through ceremonies, rituals initiation, recitation and demonstration. They involves in practical farming, fishing, weaving, cooking, caving, knitting and so on.

From the above description, it could be observed that education in old Nigeria, which (indigenous education) was an integrated experience. It combines physical training with character building and manual activities with intellectual training. As further buttress by Fafunwa, an individual was given a practical test relevant to his experience and level of his development in terms of the job to be done. This was a continuous assessment which eventually culminated to passing out ceremony on initiation into adult hood.

After all, education is the aggregate of all the processes by which a child or young adult develops the abilities, attitudes and other forms of behaviour which are of positive value to the society in which he lives. That is to say, it is a process for transmitting culture in terms of continuity and growth for disseminating knowledge either to ensure social control or to gaiety national direction of the society or both. All education system weather traditional, western oriented, seek to achieve those goals irrespective of curriculum methods organisation designed for the purpose.

As emphasised by Fafunwa (1974) one must determine the extent to which he is meeting the needs of a particular society at a given time. Traditional indigenous metal work technology education should therefore be judged not by any external consideration or some foreign yardstick, but its performance within a given social content. Many European observers tend to ignore this important fact.

The aim of traditional education has been illustrated by Fafunwa as multilateral and that the objective is to produce an individual who is honest, respective, skilled, cooperative and conforms to the social order of the day.

As emphasised by Fafunwa (1974) the educational objective of national policy on education (NPE) has identified seven aspects of traditional education which includes:

1. To develop character.
2. To develop the child latent physical skills.

3. To inculcate respect for elders and those in position of authority.
4. To develop intellectual skills.
5. To acquire specific vocational training and to develop a healthy attitude towards honest labour.
6. To develop a sense of belonging and to participate sensitively in community affairs.
7. To understand, appreciate and promote the cultural heritage of the community at large.

Indigenous metal work technology being a part of traditional education operates under the above listed goals. It is fair to say that the main reason of education in traditional society is character training and job creation.

1. Agricultural education, for example farming, fishing, and vet nary medicine.
2. Trades and crafts for examples weaving, carpentry, dress making, leather working and catering, etc.
3. Professions for examples doctors,, priest, witch doctors, civil servants, tax collectors, police, messengers, soldiers etc.

Moumouni further stated that vocational training in traditional society is largely run on the apprenticeship training and is time device for educating millions of youths and adults. Usually, the children are not trained by their parents but by their relatives, friends in order to ensure discipline and concentration.

Apprenticeship as it is rightly described by Archibald (1964) it is vast training system, begun as a part of wider education process in which the indigenous societies of Nigeria passed on their cultural heritage from generation to generation. The skills owned by the family were highly valued, and in some areas such as native medicines, blacksmithing, secrets were zealously guarded. Evidence of the passing on of the skills within families is still strong Archibald added.

In an explanatory study carried to identify learning strategies involved in indigenous crafts, Archibald (1994) found out that, learning a craft often began with personal service to the master. Apprentices who were not kin to the Ironmaster might also be required to present a large gift before obtaining knowledge of the secret rituals. The expense probably limited the number of outsiders who became masters

Young boys could become house servants to close relatives who will feed and clothe them, and after some years of promising usefulness they would then gradually be introduced to the craft of the guardians. Archibald also found out that the crafts varied according to the area.

Dunn (1978) tried to compare training approach in a formal setting to that of informal settings by saying that "in schools (that is formal setting) they based their approach to technology or scientific research, using a plan problem solving technique. They are concerned about output in relation to goals. They share information regarding improvements through well develop system. In contrast the informal setting uses crafts cultural type of approach to technology according to custom and (craft culture) uses non rationale, subjective data to make day to day decision. He went further to explain that the quality (individuality) of the product is the prime criteria for evaluation.

Summary of literature review

So far in this chapter, we have looked at the concept of indigenous metal work activities prior to the discovery of metal, people used simple tools made out of bone and wood. Soon, however, fire was discovered and eventually ancient humans discovered that adding heat to certain rocks, more accurately described as ores, could free the metal from the rock. With the discovery of fire, eventually evolved the art of extracting and smelting metals, and forming them into usable objects. Such a practice is commonly referred to as metal working. As was brought about by the development of civilization, people continually

discover ways to complete tasks. In our drive to survive, we, as humans, have developed several objects that help to make life easier. This chapter has also helped us to know that originally metal was derived from meteorites, which were considered sacred; therefore very special objects were made from it. However, it was gradually discovered that metals could be obtained from below the earth's surface.

From the history and development of indigenous metal work technology in Nigeria, this chapter has helped us to understand the before the coming of the colonial masters, metal working was practiced by several communities. Among this communities are the people of the Nok area in Kaduna state from 340BC, Taruga in the same area. Wangara in the Hausa kingdom were famous for their gold. Ife and Benin bronze works flourished in the 13^{th} and 17^{th} centuries respectively. Benin, Kano and Awka are known in blacksmithing while Ilorin combines gold and blacksmithing activities.

It has been established that many items of our daily lives are made from metals. Metals are commercially used for manufacture of ships, aeroplanes, boats, cars and various industrial machines. Iron bars are used in the construction of buildings.

The goal of indigenous metal work technology being a part of traditional education emphasises social responsibility and job orientation. In indigenous metal work training method, youths learn by doing, which is to say the youth or adolescent were engaged in participative education through ceremonies, rituals initiation, recitation and demonstration.

CHAPTER III

METHODOLOGY

This chapter describes the methodology adopted for the study. It includes research design, area of study, the population, sample, instrument for data collections, and validation of the instrument, method of data analysis and decision rule.

Research design

The research is a descriptive survey designed to investigate the assessment of the adequacy and utilization of material resources for indigenous metal work activities in Kaduna metropolis.

Area of the study

The area of study covers all the major centres and street where indigenous metal work is carried out in Kaduna metropolis. The areas includes Panteka, Sabon Tasha, Gonin Gora, Manhuta and Kakuri area

Population of the study

The population of the study consisted of 30 indigenous metal workers and 20 technical teachers found in all the centres and streets in Kaduna metropolis.

Sample

Due to the size of this population, 30 metal workers and 20 technical teachers were found during pilot testing as a result the need for sample did not arise.

Instrument for data collection

Questionnaire was the sole instrument developed by the researcher for this study based on the research questions. The questionnaire consisted of four (4) sections as follows: Section I: Contains 10 items dealing with the adequacy of materials resources for indigenous metal work activities in Kaduna metropolis.

Section II: Contains 12 items dealing with the extents of utilization of available material resources for indigenous metal work activities.

Section III: Contains 13 items dealing with the challenges associated with the indigenous metal work activities in Kaduna metropolis.

Section IV: Contains 15 items dealing with the ways of reducing challenges to indigenous metal work activities.

All items were anticipated to be responded to by ticking the most preferred option along the scale of 4 – 1. The values allocated to the scale are as follows:

HA – Highly Adequate	VHE – Very High Extent	SA – Strongly Agreed
A – Adequate	HE – High Extent	A - Agreed
IA – Inadequate	LE – Moderate Extent	DA - Disagreed
HIA – Highly Inadequate	VLE – Low Extent	SDA – Strongly Disagreed

Validation of instrument

The instrument was validated by two other lecturers in the department of Industrial and Technology Education, Federal university of technology, Minna. All necessary corrections were noted and the final draft was reproduced.

Administration of the instrument

The questionnaire for the study was administered to the metal workers that can read and write by direct delivery technique that is on the spot method to minimize mistakes and misuse of the questionnaire. For the most of those who cannot read and write, the researcher and two research assistants interpret the questionnaire to the respondents and tick in the column of their options.

Each of the questionnaire was accompanied by a latter introducing the researcher and the purpose of the study to the respondents. Sufficient guide were provided. A total number of 50 questionnaires were distributed to the respondents.

Method of data analysis

The data was analysed using frequency counts, and mean. The acceptance level for favourable related item was $\frac{4+3+2+1}{4} = \frac{10}{4} = 2.50$

In line with the above rating, any item that attracts up to 2.50 points and above is considered "agreed" and any item below 2.50 points is considered as 'disagreed". The men was analysed using the below formula:

$$X = \frac{\sum fx}{N}$$

Where X = mean

$\sum$ = sum of

fx = frequency of scores distribution

N = Number of respondents

Decision rule

To determine the acceptance level, a mean of 2.50 was selected as a deciding point between agreed and disagreed; in other words, response with a mean of 2.50 and above was considered agreed while response below 2.50 was disagreed.

CHAPTER IV

PRESENTATION AND DATA ANALYSIS

This chapter deals with the presentation and analysis of data with respect to the research questions formulated for this study, the result of this data analysis for the research questions are presented as follows.

Research Question 1

How adequate are the materials resources for indigenous metal work activities in Kaduna metropolis?

Table 1:
Mean responses of indigenous metal workers and technical teacherson thematerials resources for indigenous metal work activities in Kaduna metropolis

S/N	ITEMS	X_1	X_2	X_t	Remarks
1.	Beverage tins/cans scrap	3.57	3.30	3.44	Adequate
2.	Aluminium scraps from homes	3.50	3.10	3.30	Adequate
3.	Steels scrap	2.73	3.10	2.92	Adequate
4.	Cast iron scrap	2.73	3.00	2.87	Adequate
5.	Metallic scraps from industries	3.13	2.60	2.87	Adequate
6.	Vehicle bodies scrap	3.67	3.55	3.61	Adequate
7.	Used electronic items	3.73	2.15	2.94	Adequate
8.	Scraps of electrical copper wires	3.20	3.15	3.18	Adequate
9.	Aluminium electrical cables	3.40	3.85	3.63	Adequate
10.	Used jewellery	2.87	3.60	3.24	Adequate

N_1=30, N_2=20

Key

N1 = Numbers of indigenous metal workers

N2= Numbers of technical teachers

X = Mean of indigenous metal workers

X2 = Mean of technical teachers

Xt = Average mean of indigenous metal workers and technical teachers

The data presented in Table two revealed that the respondents are highly adequate with all the items with mean score ranging between 2.87-3.63

Research Question 2

What is the extent of utilization of available material resources for indigenous metal work activities?

Table 2
The mean responses of the indigenous metal workers and technical teacherson the extent of utilization of available material resources for indigenous metal work activities

S/N	ITEMS	X_1	X_2	X_t	Remarks
11	Aluminium scraps are used for casting of pots	3.83	3.90	3.87	H-Extent
12	Iron scraps are used for producing locks	2.70	3.25	2.98	H-Extent
13	Steel scraps for making knives	2.27	2.40	2.34	L-Extent
14	Beverage tins/cans are melted and used for making of pots, pans etc.	3.70	3.55	3.63	H-Extent
15	Used jewellery are re-used for the same purpose	2.20	3.90	3.05	H-Extent
16	Cast iron scrap for making hammers	1.90	2.35	2.13	L-Extent
17	Copper scraps for making decorative art like statues and sculptures	2.00	2.50	2.25	L-Extent
18	Vehicle body scraps are used for making knives	1.97	2.00	1.99	L-Extent
19	Used electronic item parts are used for making graters and filters	1.90	2.60	2.25	L-Extent
20	Aluminium scraps are used to cast cups, pots etc.	3.70	3.65	3.68	H-Extent
21	Steel scraps are used for making cooking pots and kitchen cutleries like knives	2.47	2.70	2.59	H-Extent
22	Copper wires are used for making jewelleries	3.27	2.65	2.96	H-Extent

The data presented in table three revealed that the respondents very high extent with all the items with mean score ranging between 2.59-3.87 and low extent with the items on 13, 16, 17, 18 and 19 with mean score of 1.99-2.34.

Research Question 3

What are the challenges associated with the indigenous metal work activities in Kaduna metropolis?

Table 3:
the mean responses of indigenous metal workers and technical teacherson thechallenges associated with the indigenous metal work activities in Kaduna metropolis

S/N	ITEMS	X_1	X_2	X_t	Remarks
23	Lack of encouragement from the Government	3.73	3.80	3.77	Agree
24	The materials used are not easily available	3.20	2.00	2.60	Agree
25	Lack of idea sharing among local craftsmen in their related areas	3.53	2.10	2.82	Agree
26	No enough fund to purchase raw materials	3.37	2.30	2.84	Agree
27	Poor working environment	3.57	2.50	3.04	Agree
28	Lack of basic education affects their activities	3.33	2.00	2.67	Agree
29	The tools being used are not standard	3.23	3.00	3.12	Agree
30	There are no machine tools for the production of the products	3.33	2.45	2.89	Agree
31	There is no enough trainings for the craftsmen	3.17	2.60	2.89	Agree
32	Lack of enough and sufficient space in the workshop	3.27	3.10	3.19	Agree
33	Poor development of basic raw materials such as ferrous and non-ferrous metals (e.g. steel, aluminium, copper, cast iron)	3.13	3.50	3.32	Agree
34	Stiff competition from importers of similar products	3.63	3.25	3.44	Agree
35	Non provision or poor provision of necessary infrastructures such as electricity, water, and motor-able roads.	3.73	3.60	3.67	Agree

The data presented in table three revealed that the respondents agreed with all the items with mean score ranging between 2.60 to 3.77

Research Question 4

What are the ways of reducing challenges to indigenous metal work activities?

Table 4:
The mean responses of indigenous metal workers and technical teacherson the ways of reducing challenges to indigenous metal work activities

S/N	ITEMS	X_1	X_2	X_t	Remarks
36	Receiving further trainings from other related workshop	2.90	3.70	3.30	Agree
37	Short term training conducted in the local language can be used to up-date the master craftsmen knowledge	3.30	3.40	3.35	Agree
38	The local craftsmen should be taught basic technical theories once in a while	3.00	3.00	3.00	Agree
39	State ministry of works should regulate and supervise the activities of the local craftsmen	3.17	3.60	3.39	Agree
40	Regular practical workshop training should be organized for the local craftsmen	3.27	3.20	3.24	Agree
41	Need to be registered with either local or state Government for easy assistance.	3.47	3.70	3.59	Agree
42	Inviting resource persons from polytechnics and universities for part time training	2.77	3.40	3.09	Agree
43	Receiving loan from Government organizations or voluntary organizations	3.83	3.70	3.77	Agree
44	The National Directorate for Employment (NDE) should be organizing qualifying examination for the local craftsmen	3.13	3.20	3.17	Agree
45	Local craftsmen should be certified before they establish their workshop	3.10	2.10	2.60	Agree
46	Each local craftsman should have a minimum of Federal Labour Trade Test III before being allowed to practice	2.37	2.60	2.49	Disagree
47	The consumer protection agency should intensify orientation for preference of indigenous products than depending on foreign ones	3.37	3.75	3.56	Agree
48	The educational curriculum of the Nation should be reviewed to bring pride of palace to indigenous crafts and copy technology	3.13	3.15	3.14	Agree
49	There should be induction programme for local craftsmen	3.23	3.10	3.17	Agree
50	Special craft and enterprise centres should be established in several locations to serve as problem-based indigenous knowledge system for the craft men	2.80	3.60	3.20	Agree

The data presented in table four revealed that the respondents agreed with all the items with mean score ranging between 2.06-3.77 and disagree with the items on 46 with mean score of 2.49

Hypothesis I

There is no significant difference between the mean responses of the technical teachers and the indigenous metal workers in Kaduna metropolis on the adequacy of material resources for indigenous metal work activities.

Table 5:
t- test analysis of indigenous metal workers and technical teachers regarding theadequacy of materials resources for indigenous metal work activities.

S/N	ITEMS	X_1	X_2	SD_1	SD_2	T-cal	Remarks
1.	Beverage tins/cans scrap	3.57	3.30	3.57	3.30	0.97	NS
2.	Aluminium scraps from homes	3.50	3.10	3.50	3.10	1.54	NS
3.	Steels scrap	2.73	3.10	2.73	3.10	-1.42	NS
4.	Cast iron scrap	2.73	3.00	2.73	3.00	-0.93	NS
5.	Metallic scraps from industries	3.13	2.60	3.13	2.60	1.75	NS
6.	Vehicle bodies scrap	3.67	3.55	3.67	3.55	0.64	NS
7.	Used electronic items	3.73	2.15	3.73	2.15	6.89	S
8.	Scraps of electrical copper wires	3.20	3.15	3.20	3.15	0.20	NS
9.	Aluminium electrical cables	3.40	3.85	3.40	3.85	-3.11	S
10.	Used jewellery	2.87	3.60	2.87	3.60	-3.05	S

N1 = 30 N2 = 20

Key

N1 = Numbers indigenous metal workers

N2 = Numbers of technical teachers

S.D1= standard deviation of indigenous metal workers

S.D2 = standard deviation of technical teachers

t= t-test value of indigenous metal workers and technical teachers

S= Significant.

NS= Not significant.

The analysis in this table 5: showed that the t-cal values of all the 10 items were below the t-cal except for 8 items 7, 9 and 10. Therefore, the null hypothesis was rejected for each of the three items while it was accepted for each of seven items. Hence the opinion of the respondents differed in three items but did not differ in seven items in relation to the adequacy of materials resources for indigenous metal work activities.

Hypothesis II

There is no significant difference between the mean responses of the teachers and the indigenous metal workers in Kaduna metropolis on the extent of utilization of available material resources for indigenous metal work activities.

Table 6:
t- test analysis of indigenous metal workers and technical teachers regarding the extent of utilization of available material resources for indigenous metal work activities.

S/N	ITEMS	X_1	X_2	SD_1	SD_2	T-cal	Remarks
11	The materials used are not easily available	3.20	2.00	3.20	2.00	3.89	S
12	Lack of idea sharing among local craftsmen in their related areas	3.53	2.10	3.53	2.10	5.28	S
13	No enough fund to purchase raw materials	3.37	2.30	3.37	2.30	3.60	S
14	Poor working environment	3.57	2.50	3.57	2.50	3.69	S
15	Lack of basic education affects their activities	3.33	2.00	3.33	2.00	4.67	S
16	The tools being used are not standard	3.23	3.00	3.23	3.00	0.73	NS
17	There are no machine tools for the production of the products	3.33	2.45	3.33	2.45	3.06	S
18	There is no enough trainings for the craftsmen	3.17	2.60	3.17	2.60	2.10	S
19	Lack of enough and sufficient space in the workshop	3.28	3.10	3.28	3.10	0.66	NS
20	Poor development of basic raw materials such as ferrous and non-ferrous metals (e.g. steel, aluminium, copper, cast iron)	3.13	3.50	3.13	3.50	-1.47	NS
21	Stiff competition from importers of similar products	3.63	3.25	3.63	3.25	1.99	S
22	Non provision or poor provision of necessary infrastructures such as electricity, water, and motor-able roads.	3.73	3.60	3.73	3.60	0.81	NS

N1 = 30N2 = 20

The analysis in this table 6: showed that the t-cal values of all the 12 items were below the t-cal except for 8 items 11, 12, 13, 14, 15, 17, 18 and 21. Therefore, the null hypothesis was rejected for each of the eight items while it was accepted for each of four items. Hence the opinion of the respondents differed in eight items but did not differ in four items in relation to the extent of utilization of available material resources for indigenous metal work activities.

Findings

Based on the data collected and analyzed, the following findings were made according to the research questions raised for the study.

Findings related to how adequate are the materials resources for indigenous metal work activities in Kaduna metropolis

1. Beverage tins/cans scrap.
2. Metallic scraps from industries.
3. Aluminium electrical cables.
4. Used jewellery

Findings related to the extent of utilization of available material resources for indigenous metal work activities

1. Aluminium scraps are used for casting of pots.
2. Iron scraps are used for producing locks.
3. Aluminium scraps are used to cast cups, pots etc.
4. Steel scraps are used for making cooking pots and kitchen cutleries like knives.
5. Copper wires are used for making jewelleries

Findings related to the challenges associated with the indigenous metal work activities in Kaduna metropolis

1. The materials used are not easily available.
2. Lack of idea sharing among local craftsmen in their related areas.
3. No enough fund to purchase raw materials.
4. Lack of basic education affects their activities

Findings related to the ways of reducing challenges to indigenous metal work activities?

1. Receiving further trainings from other related workshop.

2. Short term training conducted in the local language can be used to up-date the master craftsmen knowledge.
3. The local craftsmen should be taught basic technical theories once in a while.
4. Regular practical workshop training should be organised for the local craftsmen

Discussion of the findings

The discussions of the findings are based on the research questions raised for the study.

The findings from table 1 indicate that Metallic scraps from industries. In the area of Agriculture, Blacksmith are able to improve and manufacture farm implement such as hoe, cutlasses, Axe, etc. with the metals gotten from industries in the form of metallic scraps. This is a significant land mark in the history of Agriculture technology in Kaduna and Nigeria as a whole in the sense that the tools so manufactured replaced the wooden and stone tools, which were used by the early man.

The findings also revealed that Beverage tins/cans scrap and used jewellery. Majorly, pots used for cooking are made of aluminium can be gotten from beverage tins. Aluminium is a great conductor of heat and corrosion resistant which makes it suitable for cooking. First, copper and gold were rare and expensive, and therefore, were useful for conspicuous display of wealth or high status. A common use of metal objects in many societies is to mark major changes in a person's life cycle. Age and gender were often critical determinants regarding the type, form, and number of objects used. During the history, for example, some societies use elaborate iron jewellery at the naming ceremony of a new born to symbolize the connections to the infant's ancestors, as well as familiar continuity through rebirth.

Findings from table 2 revealed that Aluminium scraps are used for casting of pots. Aluminium is a great conductor of heat and corrosion resistant which makes it suitable for cooking. There is production of aluminium metal pots of various sizes and shapes for domestic and commercial uses and also for festivities. Aluminium is cheaper and readily

available compared to steel and other metals, which makes the items produced from it cheaper.

The findings also revealed that iron scraps are used for producing locks. This is in line with Childs &Killick (2001). Several direct or indirect economic functions of African metals have been recognized and explored to varying degrees, example are in agricultural production, warfare, trade over varying distances, currency with values set for specialized or general purposes, and a means of storing wealth. There has remarkably been study of agricultural tools and weapons of metal in Africa. Much more attention has been paid to metals as items of trade, particularly in relation to the rise of African states.

Findings from table 4 indicated that receiving further trainings from other related workshop. This is in line with Dunn (1978) who tried to compare training approach in a formal setting to that of informal settings by saying that "in schools (that is formal setting) they based their approach to technology or scientific research, using a plan problem solving technique. They are concerned about output in relation to goals. They share information regarding improvements through well-developed system. In contrast the informal setting uses crafts cultural type of approach to technology according to custom and (craft culture) uses non rationale, subjective data to make day to day decision. He went further to explain that the quality (individuality) of the product is the prime criteria for evaluation.

Findings from the study also indicated that Short term training conducted in the local language can be used to up-date the master craftsmen knowledge This was supported by Fafunwa (1974) who reveals that indigenous education emphasis social responsibility, job orientation, political participation and spiritual values. In indigenous education, youths learn by doing, which is to say the children or adolescent were engaged in participative education through ceremonies, rituals initiation, recitation and demonstration. They involves in practical farming, fishing, weaving, cooking, caving, knitting and so on. From the above

description, it could be observed that education in old Nigeria, which (indigenous education) was an integrated experience. It combines physical training with character building and manual activities with intellectual training. As further buttress by Fafunwa, an individual was given a practical test relevant to his experience and level of his development in terms of the job to be done. This was a continuous assessment which eventually culminated to passing out ceremony on initiation into adult hood.

Findings from the study indicated that the local craftsmen should be taught basic technical theories once in a while. This was supported by Garba (1990). Who state that the origins of the technology culture are very pre-colonial in setting. Indigenous metal work technology has responded to the needs of the Nigeria societies long before the era of modern technology. Today that technology still exist among several communities who have been practicing this type of metal work technology and is equally utilized to serve the needs of the people. Although not much has been written on the history of indigenous metal work technology of the pre-colonial Nigeria societies, yet there is enough evidence to belief that indigenous metal work technology grew up with these peoples in those communities and became part and parcel of their culture. It was from this antiquated technology that the present structure was built.

The findings also revealed that regular practical workshop training should be organized for the local craftsmen. As emphasized by Fafunwa (1974) one must determine the extent to which he is meeting the needs of a particular society at a given time. Traditional indigenous metal work technology education should therefore be judged not by any external consideration or some foreign yardstick, but its performance within a given social content. Many European observers tend to ignore this important fact. As emphasized by Fafunwa (1974) the educational objective of national policy on education (NPE) has identified seven aspects of traditional education which includes:

8. To develop character.
9. To develop the child latent physical skills.
10. To inculcate respect for elders and those in position of authority.
11. To develop intellectual skills.
12. To acquire specific vocational training and to develop a healthy attitude towards honest labour.
13. To develop a sense of belonging and to participate sensitively in community affairs.
14. To understand, appreciate and promote the cultural heritage of the community at large.

Apprenticeship as it is rightly described by Archibald (1964) it is vast training system, begun as a part of wider education process in which the indigenous societies of Nigeria passed on their cultural heritage from generation to generation. The skills owned by the family were highly valued, and in some areas such as native medicines, blacksmithing, secrets were zealously guarded. Evidence of the passing on of the skills within families is still strong Archibald added

CHAPTER V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Summary of the study

The main focus of this research study was to assess the adequacy and utilization of material resources for indigenous metal work activities in Kaduna metropolis. The first chapter discussed indigenous technology as the technology that can be obtained by developing it internally using local resources and skill appropriate to its needs. The purpose of the study was itemized to the extent of utilization of available material resources for indigenous metal work activities, ways of reducing challenges of indigenous metal work activities and challenges associated with the indigenous metal work activities in Kaduna metropolis, and the significance identified. The concept of indigenous metal work activities, history and development of indigenous metal works in Nigeria, need for assessing indigenous material resources on indigenous metal work activities, influence of adequate material resources on indigenous metal work activities, utilization of metallic material resources for the production of metallic equipment and goals and training methods of indigenous metal work technology in Nigeria were all discussed in the second chapter which is the literature review.

The third chapter involved the research methodology which includes research design that employed a descriptive survey of Kaduna metropolis, designed to assess the adequacy and utilization of material resources for indigenous metal work activities as the area of study, 50 respondents were derived of which 30 are indigenous metal workers and 20 technical teachers. The instrument for data collection was a well-structured questionnaire of 50 items. The data collected were analysed using statistical tools to determine the hypotheses responses and the findings discussed. Finally, the study was summarized in chapter five, implications were stated and discussed, the study was concluded and recommendations were made.

Implication of the findings

The findings of the study have far reaching implications on the Government, the indigenous metal workers and the public at large.

The finding regarding the assessment of the adequacy and utilization of material resources by indigenous metal workers show that a sound practical skills and theory that can enhance adequate utilization of material resource must be possessed by the craftsmen. Therefore Government should provide means of retraining the craftsmen for the improvement of their products in other to compete with imported or foreign items.

Conclusion

Base on the analysis of the findings and considering the number of items that have been produced by the indigenous metal workers in Kaduna metropolis, if giving adequate fund and encouragement, it is expected that more items could be produced based on the economic conditions of the nation.

The findings of this study draw our attention that indigenous metal work technology has been in existence even before the coming of the colonial masters and the missionaries and was a means of livelihood to does who engage in this practices. If Government should provide technical assistance and a good working environment through her agencies, this will help provide job opportunities to our unemployed youths.

Recommendations

Base on the findings of the study the following recommendations were made:.

1. Short term courses in the local language should be used to up-date the master craftsmen's knowledge.
2. National directorate for employment and youth empowerment scheme should provide more training, certificating and soft loans for craftsmen.

3. Government should make fund available in the form of loans for indigenous metal workers.
4. Government should formulate policies that will encourage the use of locally/indigenously made products.
5. Regular practical workshop should be organised for indigenous metal workers.
6. There should be establishment of Industries for the development of basic raw materials such as ferrous and non-ferrous metals (e.g. steel, aluminium, copper, cast iron).

Suggestions for Further Research

The following suggestions were made for further study:.

1. Strategies for improving cottages and small scale industries.
2. Strategies for effective utilization of metallic and non-metallic waste materials by local craftsmen.
3. The problems militating against Nigeria technology development.
4. Strategies for improving the Master Craftsmen of the non-formal Apprenticeship programme.

Reference

Abubakar N. (1984), Iron Technology in Northern Nigeria, C500 BC to 1900 AD, part 1. ZAD volume VI, Zaria.

Atsumbe B. N. (2004). Strategies for improving the preparation of Master Craftsmen/Teachers of the non- formal and formal Apprenticeship programme. Spectrum Journal Kaduna Polytechnics 5; (2) 24-27.

Basse, Sani Isa (2004). A research project on: Effective Utilization Of Metallic And Non Metallic Waste Materials By Local Craftsmen In Minna Metropolis.

Dewey, W. J. and Roberts, A. F. (1993) 'Iron, Master of Them All.

Fafunwa A. B. (1974). History of Education in Nigeria London, George Allen Unwin.

Femi Kayode , T. L. Akinbogun and BankoleOjo (2010). Appearance of good craftsmanship education in the development of Nigerian children.

Groce, Nora (1980). Ornaments of Metal: Rings, Medallions, Combs, Beads and Pendants. In Burr's Hill, A 17th Century Wampanoag Burial Ground in Warren, Rhode Island. S.G. Gibson, ed. Pp. 108-117. Brown University, RI: Haffenreffer Museum of Anthropology.

Herbert EW. (1993). Iron, Gender and Power*:* Rituals of Transformation in African

Housden J, Armor M. (1959). Indigenous iron smelters at Kalabo.A'.Rhodesia J.

International Iron and Steel Institute (2000) web site, (www.worldsteel.org)

Killick DJ, van der Merwe NJ, Gordon RB, Grebenart D. (1988).Reassessment of the evidence for early metallurgy in Niger, West Africa.J. Archaeol. Sci. 15:367-94

Killick DJ. 1990. Technology in its .socialsetting: bloomery iron-working atKasungu, Malawi, 1860-1940. Yale Univ.

Microsoft Encarta Encyclopaedia (2009)

ObaghoEhinonbhenLoveth (2011). A research project on: Indigenous Iron Works in the 19thcenturyin the Benin City.

Olaoye R A (1990). Indigenous Technology in Nigeria.The Chronicler, Journal of theStudents' Historical University of Ilorin, 7: 2-4.

Olueagba, B. J. (1986), Industrial and Technology development, A Rational perspective paper presented to the committee of Deans of Engineering at the 17th meeting, university of Ilorin.

Onipede Kayode (2003). Technology Development in Nigeria.An Assessment.Paper Presented at a seminar of the Department of History, University of Ilorin. April 4, 2003.

S, Terry Childs and David Killick (1993).indigenous African metallurgy: nature and culture.

Sherby, O. D. and Wadsworth, J. (2001) 'Ancient blacksmith, the iron Age, Damascus steels, and modern metallurgy', Journal of Materials Processing Technology, Volume117, pp. 347-351, Elsevier, Societies.Bloomington: Ind. Univ. Press. In press

T E Norgate and W J Rankin (2001).The role of metals in sustainable development.

Warren, D. M. (1992).Strengthening Indigenous Nigerian Organizations and Associations for Rural Development: The Case study of Ara Community.Occasional Paper No. 1. Ibadan: African Resource Centre for Indigenous Knowledge.

Wilbur, C. Keith (1990) Indian Handcrafts; How to Craft Dozens of Practical Objects Using Traditional Indian Techniques. Chester, CT: Globe Pequot Press.

Y. A. Abdulkareem (1992). Raw materials research and development council workshop for the processing of raw materials on October 6th.