COMPETENCIES NEEDED BY ROAD SIDE PANEL BEATERS IN THE REPAIR OF AUTOMOBILE BODIES IN MINNA METROPOLIS

BY

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2016/1/63805TI

DEPARTMENT OF INDUSTRIAL AND TECHNOLOGY EDUCATION

FEDERAL UNIVERSITY OF TECHNOLOGY MINNA

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A PROJECT SUBMITTED TO THE DEPARTMENT OF SCIENCE EDUCATION, SCHOOL OF SCIENCE AND TECHNOLOGY EDUCATION, FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA, NIGERIA, IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF BACHELOR OF TECHNOLOGY (B.Tech) IN SCIENCE EDUCATION

APRIL, 2023

DECLARATION

I…….. Matric No: ……..

an undergraduate student of the Department of Industrial and Technology Education certify 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 & Matric No. Signature & Date

CERTIFICATION

This project has been read and approved as meeting the requirements for the award of

B. Tech degree in Industrial and Technology Education, School of science and Technology

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Mr. Benjami Ekhalia _____

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Prof I.Y. Shehu _____

External Examiner Signature & Date

DEDICATION

This project is dedicated to Almighty Allah, the most merciful, the most beneficent, the most gracious, the omnipresent and omniscient.

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CHAPTER ONE

1.0 INTRODUCTION

1.1 Background to the Study

Panel beating trades is a branch of automobile technology that deals with the repairing damage to metal, plastic and fiberglass bodywork on vehicles, make panels using machines or hand tools, determine vehicle damage, recommend repair procedures and prepare written repair quotations (Olorunsogo, 2017). Automobile body panel builders realign both the structure and the panelling of both light and heavy good vehicles after they have been involved in collisions. This can often be a complex process as each collision will present different degrees and directions of damage. The repaired vehicle must conform to the stringent specifications laid down by the vehicle manufacturer and meet both their tolerances and their safety specifications. An automobile body panel builders needs to be familiar with mechanical components and their function as well as the specific and often complex safety restraint systems (SRS) fitted to modern vehicles. The automobile body panel builders returns the vehicle to a condition where it ready for refinishing by a car painter (Nwagbufo, 2016). An automobile body panel builders works in a specialist garage dedicated to repair and equipped with the machinery and equipment suitable to repair a wide variety of modern private and commercial vehicles (Abwage, 2019).

An automobile body panel builders is also called a panel beater whose work is often divided between major and minor collision damage; however competency in both areas may often be used on the same vehicle (Arul, 2017). In a major collision repair the automobile body panel builder will mount the vehicle onto a specialized body jig with which he or she can diagnose the direction and extent of the misalignment to the car

body structure. He or she then attaches heavy hydraulic pulling equipment to the body and uses this pulling force to reverse the damaging force. After the misalignment has been rectified to the structure the repairer will normally have to remove damaged structural and non-structural members which are replaced with new sections or part sections using various welding processes and/or riveting and bonding (Fetherston, 2019). For a minor collision an automobile body panel builder may replace or repair non-structural panels to a condition suitable for refinishing with paint. An automobile body panel builders must be able to use vehicle body alignment benches and associated measuring equipment (universal and fixed bracket) as a means of assessing the extent of damage and reinstating the structure to its original specifications. An automobile body panel builder must be a skilled welder who is capable of joining a variety of metals such as low carbon steel, high strength steels or aluminium alloys using metal active gas welding (MAG), tungsten inert gas welding (TIG), and resistance spot welding. He or she must be able to select the correct consumables for the metal being welded and adjust the machine to provide an efficient high quality weld. In some circumstances body panels may be replaced using bonding and riveting equipment. The automobile panel builder or panel beater must be able to prepare, adjust and use this equipment effectively following manufacturers specifications to reinstate damage panels (Hillier and Coombes, 2014).

A panel beater is an automobile technicians who repairs vehicle bodies back to their factory state after having been damaged (Schafer, 2015). They do this using many skills such as planishing as well as various other metalworking techniques, welding, use of putty fillers, and many more. Sometime cars could be left unused as a result of accident, this is when a repair may be required by panel beater to either repair or replace various parts of the vehicle (Olorunsogo, 2014). These parts may be made from various metals

including various steels and alloys, many different plastics, fibreglass and others. The common panel beaters work on everyday vehicles, cars, vans for example. Specialised areas include repairs of motorcycles, trucks and even aircraft. Some panel beaters also work exclusively on vehicle restorations, and do not repair smash work at all. Others may specialise in body customisation such as is seen on hot rods among others. These panel beaters need to be competent in carrying out their work (Reeds, 2013).

Panel beater must be able to remove damaged sections with minimum disruption to surrounding body work and re-attach/re-align the parts to reinstate the integrity of the body shell. These parts or panels may be welded, bolted or riveted. For minor damage that does not require the replacement of a part or panel an automobile body panel builder will use a variety of repair tools to remove the damage and reinstate the panel's original contours. The panel beater must be competent in the usage of range shaped hammers and 'dollies', bumping files, body files, pry bars and oil stones (Jubril, 2017).

Competency as the ability to do something well. Competency is also known as the capability to apply or use a set of related knowledge, skills, and abilities required to successfully perform "critical work functions" or tasks in a defined work setting (Hornsby, 2014). Competencies often serve as the basis for skill standards that specify the level of knowledge, skills and abilities required for success in the workplace as well as potential measurement criteria for assessing competency attainment. The level of satisfaction gotten from the competency of automobile panel beater work carried out on car body panels is low and it is a thing of concern (Osuala, 2019).One of the reasons why the job requirement are not met is as a result of low competencies possessed on the usage of tools and equipment, dependent on the old technique of working and non-cooperation among panel beaters and hat competency play a lot of role in metalwork

industry, without consistency and hard work the process of appropriate service will never be guaranteed, and there would not be any competent work. A panel beater without competency will always perform poorly, and that will end up giving the profession bad name, when a panel beater lack this knowledge and attitude to know what is best for car production or how to rebuild part, then there is every need for adequate training. Competency have much input in automobile industry, even in metal technology, it was discovered that most of the metal we see around today has their different use. As a panel beater, there is need for proper training in order to complete a trade apprenticeship. These usually consist of three years on the job training mixed with schooling at a trade school. The fourth year is usually on the job training alone (Tanaka, 2013).

Moreover, when conducting a panel beating work, sheet metals are mostly used, and sheet metal is known as a flat pieces or coiled strips. For a panel beater to be competent, one of the major thing that must be known is to have deep knowledge on metals and the chemistry behind each metal needed for panel beating work because the panel beater works on anything that can be beaten to shape on either a car, motorcycle, aeroplane and for that reasons the panel beater needs to be versatile in knowing his metals. According to Eckold (2015), the thickness of sheet metal is commonly specified by a traditional, non-linear measure known as its gauge. There are many different metals that can be made into sheet metal, such as aluminium, brass, copper, steel, tin, nickel and titanium. When panel beating or replacing car parts, sheet metal is best needed, also airplane wings, medical tables and many other applications (Chung, 2018). Sheet metal of iron and other materials with high magnetic permeability, also known as laminated steel cores, has applications in transformers and electric machines. Historically, an important use of sheet metal was in plate armour worn by cavalry, and sheet metal

continues to have many decorative uses, including in horse tack. Panel beaters tend to patronise the sheet metal the most. Panel beaters involved some metal operations, which are stretching or drawing techniques with or without an anvil support (Jeswiet, 2015). This operation has tag some panel beater as competent in carrying out panel beating work. They form the sheet metal by using a round headed tool which moves down vertically. The sheet metal is typically held by fixtures along the edges to avoid movement caused by tool, either the sheet metal or the tool is moved along certain axes. When a panel beater is highly skilled or competent enough, then he can employ this technique to achieve a smooth finishing. By closely observing and analysing the human skills of experienced panel beaters, it is perceived that consecutive shrinking and stretching (through hammering) of sheet metal will allow the workpiece to have uniform thickness while being formed (Osuala, 2016). Imposing repetitive kinetic energy through hammering allows better control over producing shapes by consecutive stretching and shrinking without fixtures. This method is also believed to improve release of residual stresses during the forming process. Sheet metal is metal formed by an industrial process into thin, flat pieces. It is one of the fundamental forms used by panel beaters in metalworking and it can be cut and bent into a variety of shapes so that it can suit its usefulness in the repair of automobile car parts (Olaitan and Ikeh, 2015).

1.2 Statement of the Problem

In Nigeria, metal technology have been neglected because, it was discovered that more work is needed from metal artisan, most people tend to run away, so as to avoid the stress in it (Fetherston, 2018). The availability of competent metal artisan are very rare, people tend to practice panel beating anyhow without considering the fact that, there is need for us to have much automobile, even the government do not even show much

interest in investing in this delicate sector (Penn, 2019). Also level of illiteracy has affected most Nigerian panel beaters, most of them lack formal education, and don't even know what is required to be a competent panel beater. Even with the advent in technology, yet this nation can't even produce indigenous cars. Incompetency level increase particularly in Niger state and these are problems because it is as a result of the use of outdated tools and equipment, utilising old working techniques, inability to use modern equipment and using wrong materials that suits the particular job specification and it is because no good metal workshop where metal can be transform into car parts, moreover in Niger state it is ordinary metal practitioners who only transform metal as pot and plate that are available. This is because of lack of adequate training, awareness, availability of resources and lack of competency (Arul, 2017). Based on this insight the panel beaters are needed to be trained and equipped with the required competency on automobile panel beating, therefore the study investigate the competencies needed by road side panel beater in the repair of automobile body panels in Minna metropolis.

1.3 Purpose of the Study

The purpose of this study is to determine competencies needed by road side panel beaters in the repair of automobile bodies in Minna metropolis. Specifically the study will determine the:

1. Competencies needed by panel beaters in the repair of automobile body parts.
2. competencies of panel beaters in repair of accidental vehicle.
3. Competencies needed by panel beaters in the use of oxy acetylene gas welding.

1.4 Significance of the Study

Upon the completion of this study, it will be of great significance to the following, panel beaters, metal workers, society and the state government.

Panel beaters will benefit from this research once is completed, it will help them in carrying out their work properly, it will make them to be competent when constructing indigenous parts, during measurement, they won't be found wanting or incompetent. Also it will make them to see training as a paramount thing they ought to be part of before doing their job well.

Metal workers will be a beneficiary of this research when completed, it will increase their level of performance in construction industry, it will make them to boost their competent skills, so as to meet up with the demand of the industry, it will also help them with an awareness to go for additional training or course, with this, Nigeria construction industry can produce quality product.

The society will be a beneficiary of this research when completed, this will help to protect the environment, because there are a lot of abandon cars as a result of accident, when the society is aware of this, they access competent panel beaters and also can pick those scrap material and sell it to construction industry to recycle for useful purpose.

Technical colleges are going to benefit from this research when completed, it will promote the level of performance in teaching and learning, it will help the teachers to orientate the students on the need to be competent, and also the important of panel beating profession in today's contemporary settings, this will help those students who wants to learn panel beating work to start looking forward to it.

The state government will also be a beneficiary from this research when completed, it will help them to organise forum, which will help to orientate the society on the need to

make panel beating as a profession in this contemporary society, and also allocate money for the construction of industry where car and car parts can be manufactured. With this, it will make Nigeria a productive and potential nation in Africa.

1.5 Scope of the Study

This research is on competencies needed by road side panel technicians in the repair of automobile bodies in Minna metropolis. Specifically this study is to identify the strategies needed by panel beaters in repairing automobile body parts, the challenges that have held back the success of panel beater operation in Niger state, identify the possible solution in boosting their competency during automobile parts repairing, and also the skills needed to manufacture automobile body parts. The study will be carried out in Minna metropolis.

1.6 Research Questions

The following research question were raised to guide the study;

1. What are the competencies needed by panel beaters in the repair of automobile body parts?
2. What are the competencies needed by panel beaters in repair of accidental vehicle?
3. What are the competencies needed by panel beaters in the use of oxy acetylene gas welding?

1.7 Hypotheses

The following hypotheses were formulated and tested at 0.05level of significance.

Ho_1: There is no significance difference in the mean responses of panel beaters and metalwork teachers on the competencies needed by panel beaters in the repair of automobile car parts

Ho_2: There is no significance difference in the mean responses of panel beaters and metalwork teachers on the competencies needed by panel beaters in repair of accidental vehicle.

Ho_3: There is no significance difference in the mean responses of panel beaters and metalwork teachers on the competencies needed by panel beaters in the use of oxy acetylene gas welding.

CHAPTER TWO

2.0 LITERATURE REVIEW

The review of the related literature is organized under the follow sub-heading

1. Metalwork Technology in Nigeria.
2. Panel beating operation.
3. Competencies of panel beaters in Nigeria.
4. Challenges faced by panel beaters in the repair of car parts.
5. Strategies that enhance the operation of panel beaters in the repair of car body parts
6. Theoretical Framework
7. Review of Related Literature
8. Summary of literature review.

2.1 Metalwork Technology in Nigeria

The early history of metal casting in Nigeria, could be described as somehow an accidental discoveries, which was brought to light by a great deal of ancient cultural heritage of the people of Nigeria. Literature review on the issue clearly showed that the artistic and scientific creativity of these cultures make the people of this subcontinent the proud owners of this historical discovery (Olorunsogo, 2014). Another history stated that, the famous Nok coupled with the societies of Igbo Ukwu and Rausa, made the cultural discoveries and archaeological findings that clearly demonstrated the people of Nigeria are associated with the earliest iron smelting in Africa. Ife and Benin developed centralized institutions that supported the development of art, especially in terracotta, brass, bronze and iron castings. The west of the Jos Plateau between the rivers, Niger and Benue, in the northern part of Nigeria, lays the Nok valley. The first discoveries of the Nok came accidentally during tin mining of this area according to Shaw and Thurston (1975). Open cast mining methods were employed to extract tin from gravels. During the course of these operations in the Nok valley before and during World War II, a number of recognizable archaeological objects had been turned out (Thurston,

1978). Some of these objects included the terra-cottas, the alluvial deposits, perforated quartz beads, tin beads, places of iron smelting furnaces, iron slag, clay draught pipes of furnaces, and quantities of foundry tools (Reeds, 2013). The people of the south in Sahara were the earliest iron smelters due to the pieces that were discovered. The various furnaces and iron slag, including the tuyeres, clay nozzle for bellows, clearly demonstrated that they were very advanced in this technology. A radiocarbon date of 500 B.C. is claimed for the Nok, and they may have started as early as 900 B.C. (Fagg, 1969). The Igbo-Ukwu is a town south of Onitsha in Anambara State of Nigeria. Like most major archaeological discoveries of Igbo-Ukwu, it was accidental (Charles, 1984). In 1938, a man named Isaiah Anozie was digging a pit to use for collecting rainwater at the back of his house. In so doing, he comes across a series of bronzes that were lying about two feet below the ground.

Further excavation on the compound of Isaiah's brothers, Jonah and Richard Anozie, produced different and more sophisticated bronze works. All the objects recovered were intricately designed and made with a complete mastery of lost wax casting (Samuel, 2016). The actual of where and how the Igbo-Ukwu bronzes and technique to make them entered this society could not be proved by the history, and is one of the enigmas of Nigeria art history. Bronze is an alloy of copper and contains a much smaller quantity of tin. Brass is an alloy of copper and zinc. The 1gbo-Ukwu castings are of bronze, with an admixture of lead, while the objects not cast by the lost wax process, but made by smelting and chasing are of almost pure copper (Thurston, 1978). This can only show that the ancient craftsmen of Igbo-Ukwu had significant knowledge of metallurgy to know that leaded bronze is more ductile than copper and is better for casting, while copper can be more easily hammered, twisted and engraved than bronze. The 1gbo-Ukwu bronze castings have been dated to the ninth century A.D., but there is evidence

which suggests that it might have been in the 15th century (Thurston, 1978). In addition to these, the lfe discoveries, or more properly, Ile-Ife, have been important to city for the Yoruba's-Western part of Nigeria. The first attention to the cultures in this part of the country was in 1910 - 1911, when the German ethnographer, Leo Frobenius, discovered evidence of an ancient art tradition in terra-cotta and bronzes (Charles, 2014). The early discoveries of these terra-cotta and bronze heads were of a remarkable naturalistic style showing a high standard of creativity of the people. Nearly 40 years after this discovery, lfe built a modern foundry, made by a sand mold technique and not lost wax as in the case of Igbo-Ukwu (Wreek, 2016). It is not known exactly when lfe art began to develop, but radiocarbon dates for the fully developed art range between the 11th and 15th centuries (Ologunofe, 2013). The Benin works of art now reside in a famous city in Edo state of Nigeria. The Benin bronzes and brass are better known than those of either lfe or 1gbo-Ukwu. Evidence of this is that an ancient Benin bronze cast mask was the symbol for the 1977 World Black Festival of the Art that took place in Nigeria in 1977. Their popularity is both because they are more numerous and because they have been known to the world outside Nigeria for a longer time and can be seen in museums both in Europe and America (Ologunofe, 2013).

The people of Benin works of art and stylish castings have been very remarkable and much has been written about them by Europeans who were intimately connected with the history of the ancient Benin City. Whether this founding art of Benin actually vanished from Ife to Benin is not yet known, but there is no significant bronze industry in Ife today. This is in contrast with the situation in Benin were craftsmen continue to produce bronze and brass sculpture for the tourist industry. However, excavations at Owo between Ife and Benin have revealed the contemporaneous presence there of an art showing both the Ife and Benin style, in time range radiocarbon - dated to the 14-15th

centuries (Willet, 2014). Thus it can be seen that there is an Ife-Benin connection in art and casting. Also in the coast of the Niger River, west of the Benue Plateau, there exist some significant bronze discoveries. Certain iconology graphic motifs shared by the Benin and the Tada bronze may indicate influences exercised on the Benin bronze during the 16th century by some, as yet unidentified, northern industry (Usman, 2013). Similarities in the technique employed between Ife bronze and Tada bronze, such as the unification of the core and mold to achieve stability during casting, would seem to indicate a connection (Willet, 2014). Concerning this historical background review of the ancient foundry men in Katsina state Nigeria, may have to believe that with the significant iron smelting of Nok culture, and the highly creative brass, bronze castings of Igbo, Ife and Benin, etc., the Katsina State Nigerian ancient craftsmen had developed sophisticated articles obtained by the people of this sub-continent.

2.2 Panel Beating Operation

Panel beater is a term utilized as a part of some Commonwealth countries to depict a man who repairs vehicle bodies back to their manufacturing plant state in the wake of having been harmed e.g., subsequent to being included in a collision (Wikipedia, 2015). In the USA and Canada, the same employment is finished via an auto body workman. They do this utilizing numerous abilities such as planishing as well as different other metalworking operations, welding, utilization of putty fillers, and some more. Mishap repair may oblige the board blender to either repair or supplant different parts of a vehicle. These parts may be produced using different metals including various steels and alloys, numerous different plastics, fiberglass and others. Some panel beaters engage in customizing of cars, which has to do with the changing of part and putting something new or something different from the manufacturer (Momoh, 2014). For most panel beaters, their apprenticeships are around four years in length, however can be

finished before why? These for the most part comprise of three years at work learning some basic thing on cutting, taking measurement and finishing. The fourth year is for the most part a Panel beaters are to be known with their skills and knowledge in highly skill process demanding years of practice for proficiency, many of its principles are sufficiently easy to assimilate, and by restraining one's ambitions until experience has been gained success in some degree is not too difficult, but being competent is most needed from that individual.

A panel beater utilizes the use of material within reach, which has a lower end tapered to fit a hole in an anvil, while the heads are of varying size and shape-flat, round, convex, etc. The sheet metal, however, may employ pieces of steel bar held in the vice, the ends filed and smoothed to different shapes. A metal hammer may also be used but then the blow is harder. A direct blow is when a hammer is used and the metal is held up from below on a metal support or stake. This type of blow stretches metal, and is also used in finishing and planishing, when blows are light and adjacent to eliminate previous marks. A floating or off-support blow with a hammer or mallet is used in conjunction with a metal support, which, however, is not on the line of impact. This type of blow will also dent and shape metal. A simple metal shape commencing as a flat disc is perhaps as good as any for initial practice, and it demonstrates the two methods which may be employed-hollowing and raising (United Nations Industrial Development Organization UNIDO, 2015). The metal is stretched and thinned; while in raising its thickness remains much the same. When using a ball-ended hammer, the panel beater bear and shape the sheet metal properly in order to ensure that there is no rough shape. The metal disc tends to pucker round the edge, and each pucker is carefully tapped, a little at a time, out towards the edge of the disc. Attempting to hasten the process may

result in the puckers flattening, overlapping, and the metal cracking. Puckers may be deliberately formed if necessary, and this method employed for rising.

2.3 Competencies of Panel Beaters in Nigeria

The use of automobile vehicles on our roads plays a key role in road transportation system. In Nigeria where land transport is largely in use compared to water transportation and other modes of transportation, the use of automobile vehicles, either diesel or petrol driven is predominant. However, the vehicles cannot remain new forever, as the parts breakdown and wear out, and so, must be maintained (Akinola, 2015). A panel beater has been define as a person who repairs vehicle bodies back to their factory state after having been damaged (Schafer, 2005). This activity of panel beaters is applicable to all wear parts, damage parts cause by accident and change of old parts. It is the panel beating activity carried out on vehicles or other machineries to make them still look as in the manufacturer state, after altered, to restore them to their original state (Okah-Avae 2016). Akinola and Ogedengbe (2015), the panel beating work on a vehicle have advanced to a very sophisticated level, and it has help in improving the level of maintenance. In Nigeria, latest vehicles' are not sometimes imported with the parts, but in Kaduna, people have experience a rapid change in one of the key company, they can competently engage in the change of any car parts, this has so much improve the competencies of panel beaters employed to serve there. Nigeria modernized road-side panel beaters have made a lot of breakthrough in building of good and quality parts from sheet metals, and this sheet metal where transform with the necessary tools that can be used for panel beating operation. The help of modern technology has also made a huge change in getting the actual size and shape, most of our panel beaters today normally go to internet and order advance books written by great engineering authors, who has wide knowledge about panel beating operation.

Competency in panel beating work helps panel beaters to require the use of more complex and highly technological and special measuring equipment to analyze the actual sheet metal to be cut for replacement (Danirel, 2014). To ensure this for efficiency, safety, comfort and style, competent panel beaters hands are required (Auto Tips, 2014). As vehicle technology and replacement of parts are available, the panel beaters keep advancing and improving on the problems facing Automobile technicians in the course of discharging their duties have adversely affected the transportation system, and hence affecting all the other systems in the country (Groover, 2013). Some of the problem auto technician is the production of damage parts as a result of accident, and also failure of vehicle parts, that's when panel beater had to make breakthrough in reproducing those damage parts, this is done in the workshop, mostly close to the road. A system with an optimum performance can be generated if all problems identified are tackled (Lindley, 2016).

This will go a long way in alleviating the problems being encountered by the auto technicians in our society. Mostly this parts has to come from improvisation, and the high level of usage of vehicles for both private and commercial activities coupled with the inflow of second hand vehicles popularly called "Tokunbo" brought about the need for very efficient and effective maintenance and change of body parts, this is because the parts that have been design for that car is not readily available at that point in time, or maybe very much expensive to afford (Smith, 2016). Often times, the panel beating workshop where the activities are carried out are of low capital base and are makeshift establishments either located on slippery terrains, under tree sheds, canopy made of banana or palm fronds, etc. No effective panel beating work can take place in such environments (Yahaya, 2016). Similarly a close look at the equipment being used reveals the level of poverty of these panel beaters. In most places, accurate

measurement are not well taken, it end up affecting the reinforcement at the sides to hold loose sands in place. No accuracy of either balancing or alignment could be obtained. New vehicles are the result of technological development, which calls for literate hands to handle. With all these facts, there is the need for a thorough competency, and this should be taken serious by the government or any agency that is looking into this sector. When competency in considered in carrying out panel beating work, there is need for good outcome in accuracy in measurement, use of the right sheet metal and the specific instrument and equipment that is mainly design for such operation (Akinsola, 2015). With the advent of all this availability, so as to evolve a system, this will make them perform optimally. Nigeria panel beaters will be able to stand their immediate counterparts that are outside the shore of this country (Trochim, 2016).

2.4 Challenges Faced by Panel Beaters in the Repair of Car Body Parts

The challenges facing panel beaters in discharging their duties, particularly in Nigeria, have to do with illiteracy rate among panel beaters. And also lack of workshop, some even use under trees. In cases where they are allowed to operate, the spaces are considered temporary and eviction occurs at the will of urban authorities (Silva & Martins, 2013). There are various conflicts relating to their sites of operation. Major conflicts often rise when the panel beaters are required to move in order to give way for a planned development. This brings them into direct confrontation with urban authorities and land developers. Most of the spaces the panel beaters occupy have no tenure, and are not allocated and sanctioned by urban authorities. At the same time, the panel beaters are also in conflict with formal shop owners and landlord who contend that the panel beater infringe on their business (Watson, 2016). The location that has been occupied by this panel will be well known by their customers, who patronize them,

when they move away from the environment where they are, it tend to force them to start all over again. Most of the sheet metal cut on the site and also the once parted aside for use could be force to be relocated, and this will end up destroying the business of the panel beater. They trade illegally due to lack of recognition and licenses. The panel beaters identify trading sites on their own, facing the urban authorities to, evict them (Kirby, 2014).

It was opined that to Echrif & Hrairi (2012), maintain that in cases of eviction, the panel beaters are often provided with an option mostly inside, where people hardly see them. This option is based on an exclusion framework which reserves that might be used for development in the later time. This framework is misguided as research has shown that when both daily fees and bribes to urban authorities are taken into consideration, the urban authorities collect much more than the lump sum paid by the licensed business (Watson, 2016). However, the informal panel beaters make less profit and are not able to make lump sum payments. Lack of permit to the panel beaters to be licenses make this more difficult for those looking for panel beaters that will fix their car body part when hit. In most cases, panel beaters are not issued with any identification showing that they have a legitimate right to carrying out panel beating operation, their materials and sometime their tools are left outside in urban streets. This make to tools the be exposes to thieves (Goldsmith, 2014). From the right to panel beater space, are also disadvantaged in the area of security, transport and municipal service and even far from where they can get access to material and tools that are not available. A secure working environment is a pre- requisite for any type of business. Security is a major concern for many people engaged in economic activities on streets. Municipal authorities have been the major source of insecurity for these panel beaters, because most of their materials are very delicate, and this makes them very much expensive. This does not only

threaten the security of panel beaters but also their customers. Rate of illiteracy among panel beaters is another major challenges face in this contemporary environment, in Nigeria, most panel beaters are not well trained to handle modern tools and equipment. Nigeria lack good educational system that can concentrate on only this part of profession, in this has so much affected the performance and the potential they ought to have exhibited if trained (Eckold 2015). Most panel beaters find it hard to meet customer to patronize them, and this has affected most of their skills, some spent time without working in the workshop, this time spent have affected their competencies and knowledge to in proving accurate measurement when giving a job to do. This is because the system does not have service in the area, and in cases where they do, this panel beaters hardly afford the service to be trained. In some cases, there are restrictions on what a panel beater can accommodated on the space given to him. This is complicated further by lack of facilities, which makes some panel beaters to carry some of the work they have to another personnel to complete (Rwigema and Venter, 2017).

Cleland (2014) says that some services they render sometimes are not enough to meet the accuracy needed by their customers. Apart from a few cities in Nigeria, panel beaters operate without an agency checkmate their skills and competencies, if it's enough to meet the standard of professionalism. The service most of them are able to come up with, are not enough to compete with those counterpart abroad. And also the governments are not really helping matter, Nigeria lack good infrastructure, poor skill management, poor resources management, inadequate manpower to meet this need, lack of money allocated to this sector and lack of awareness about the need to have such setup in a country like this. Cleland (2014) said that, panel beaters have difficulties to operate in metal technology industry, and this is as a result of poor management of available facilities. The hash trade and policy processes largely makes hard to earn

wage and own account producers in the information in the informal economy, and yet they are majority poor who are focus of current policies and development processes. The neglect of comprehensive training is a major problem, some only learn it traditionally, and produce little parts, but with the formal education, competencies will be thought, skill improvement need will be introduce. And further training needs will come into their minds. Batra (2014) argues that, the panel beaters face number of problems in promotion of units and during reproduction of parts that has damage. If these problems are not quickly addressed, it will affect a potential skills and manpower, and could cause incompetency among our panel beaters.

2.5 Strategies that Enhance the Operation of Panel Beaters in the Repair of Car Parts

There is a view that the majority of part repair on automobile body is being undertaken by panel beaters, but this is generally thought to be an activity which is done in slow periods and/or as part of the craftsmanship in the workshop. An organized forum should be available for orientation about the legitimate allowance to operate on good site, so that panel beating service can be patronized (Santini, 2014). Often times, older vehicles parts are remove and transfer to replace another damage part, this strategies limit the stress to start reconstruction parts. A number of panel beaters expressed views that only registered operators are given licensed to work at road side, the ensured some level of scrutiny and sanction of their business operations (Jeffrey, 2015). But with the help best Practice Principles, they are sent for proper training, with license which prove their competency in handling panel beating operation (Vicon, 2015). The reality is that there are a range of operations, including backyard operations, allowed under jurisdictional law. To place restrictions on who or what type of operations can undertake repairs, as distinct from vehicle repairs generally, would require legislative backing which would

need to be supported by regulatory impact statements and consideration of restricted trade implications. Such a change would require clear demonstration of the evidence and benefits, which come when the competency is properly introduced in order to convince the law that a good service is ready for people to patronize (Groves *et al.,* 2014). The panel beating stand should be well equipped with an available equipment and measuring tools, the panel beater must have good knowledge of drawing and measurement. It is of note that a car manufacturer advised that they had undertaken repairs of vehicles which had been extensively crash damaged, repaired them in accordance with their own guidelines, so when those part are been panel beaten, it should be properly done using specific kind of tool for the operation. This suggests that theoretically almost any vehicle body parts can be reproduce with indigenous materials and tools (Barber, 2013).

Furthermore, it was discovered that new people or youths are coming into it every day, so what the government need to do, is to get them to technical college where they will be trained properly and thought how to handle advance measuring tools and given out and accurate result like it was done by the manufacturing industry (Annum, 2015). Material also is a problem that should be properly addressed, there should be indigenous material for this operation, it is found that most of the material used, like sheet metals are been imported in Nigeria, but if they are manufactured by our foundry workers, this will cut down cost, in the sense that it will be more cheaper to purchase than the ones gotten outside Nigeria (Addison, 2015). Skills and Competencies of Repairers should always be sure, meanwhile, limited number of panel beater in Nigeria, have been licensed by the state Governments to function within the rule of conduct, most have chosen not to implement formal arrangements (Atsumbe, 2004). Like the United States, which has privately managed technical colleges and training centers ,who train and

accredit metal workshop that handle panel beating operation, while the United Kingdom and Canada have trade qualified panel beaters who, after completing an apprenticeship, are able to gain further industry accreditation from privately managed providers. New Zealand has recently entered into an agreement where trained panel beaters are able to access a collision repair extension program in order to update skills and competencies. This program is being provided by a private provider with the support of the New Zealand Motor Industry Training Authority. It was noted during interviews with stakeholders that changes in motor vehicle design and construction had impacted the panel (Agebure, 2014). Over here in Nigeria, such move need to be adopted in training panel beater, so that they can increase their skills and competencies, so as for Nigeria not to depend on any product that imported into Nigeria. Those successfull moves if undertaking, would go a long way to restructure metal industries in Nigeria, even the Ajaokuta steel industry located in Kogi state will eventually be revamped. The introduction of this awareness will help invest in up skilling trades people, have modern and fully equipped workshops and access to the vehicle manufacturers‘ or industry recognized trade repair manuals. It is evident that with the introduction of more complex repair techniques, those choosing not to invest in their business will be increasingly unable to undertake safe structural repairs (Eleke, 2013).

Under the proposal, heavy vehicle truck repairers would be licensed in addition to a structural repair and light panel repair class for motor cars, the need is to classify them according to the capability and skills in the field (Chibuike, 2015). A suggestion to have separate licensing for those undertaking structural repairs was also raised by a leading collision repair training provider in Australia. Most operators in the panel beating business will have gained their skills through a combination of formal learning such as through industrial training combined with on the job experience. Experienced based

learning, whilst undoubtedly valuable, is highly dependent on the quality of supervision and the breadth of exposure to a variety of learning opportunities (Ogbabore, 2014). Almost all stakeholders highlighted the need for ongoing in-service training to maintain skills and importantly to learn about the changes in vehicle design, construction and repair techniques. There were substantial changes in vehicle manufacturing methods and vehicle design during the 1990s with the advances usually seen in high end vehicles flowing down to mass production (Evim, 2013). Technology continues to evolve and the increasing prevalence of hybrid, electric and hydrogen powertrains will change the face of the repair industry. These changes relate not simply to the fuel used to power the vehicle but overall vehicle design, such as in wheel electric motors, the change of body part when damage or customizing the body part in to suitable form. In the future, if Nigeria can come up with ideas in building good body parts, and will help to motivate those that would like to explore a way to manufacture indigenous engine that the car can work with. This whole thing can work out if Nigeria panel beaters are properly trained.

2.6 Theoretical Framework

2.6.1 Action competence theory

Unlike concepts of competence, that accentuate either cognitive or motivational aspects, action competence includes all those cognitive, motivational and social prerequisites necessary and/or available for successful learning and action. The concept of action competence theory has been applied especially in the analysis of the necessary and sufficient conditions for success in meeting task, goal and success criteria in selected fields of action (e.g., profession, institution, or social group). The following components are frequently included in action competence models:

• General problem-solving competence

• Critical thinking skills

• Domain-general and domain-specific knowledge

• Realistic, positive self confidence

• Social competencies

The theoretical construct of action competence comprehensively combines those intellectual abilities, content-specific knowledge, cognitive skills, domain-specific strategies, routines and subroutines, motivational tendencies, volitional control systems, personal value orientations, and social behaviors into a complex system. Together, this system specifies the prerequisites required to fulfill the demands of a particular professional position, social role, or personal project (Boyatzis, 1982; Lévy- Leboyer, 1996).

In this theoretical perspective, the concept of action competence theory is not applied only (or primarily) to an individual's psychological prerequisites, but rather to the complementary performance dispositions across different individuals that are necessary for a group or an institution to function successfully. In addition to the cognitive and motivational components necessary for solving tasks and reaching goals, these models include other individually and collectively available skills, such as:

• Nonspecific vocational competencies (literacy)

• Specific vocational competencies (examples from the most frequently cited competencies for successful teaching: factual knowledge, classroom management competencies, diagnostic competencies, and didactic competencies).

• Institutional-specific competencies (for example, for teachers: social behavior with colleagues, parents and school administration; institutional engagement; identification with the institution, and so on).

Thus, in this approach, competence is understood less as the psychological prerequisites for successful individual action and more as the individual, role-specific and collective

conditions underlying the successful development of cultures, institutions and informal social groups. The implications of this are:

• It is not necessary for each individual in an institution to possess all the competencies necessary for successful development; rather, it is sufficient when there is a social network of competencies that allows optimal use of available institutional resources for achieving the goals of the institution.

• Although earlier collective or institutional models focused on describing necessary and required qualifications, there is now a preference for focusing on the development of institution-specific competence (Foss & Knudsen, 1996). This refers less to the acquisition of specific qualifications, and more to the development of vocational and institution-specific competencies within a collective group (of course, this may include the individual or group acquisition of specific qualifications).

• To overcome an individualized "competence barrier" described in many sociological competence models (Heyse & Erpenbeck, 1997), there is increasing attention given to the complementary development of leadership competence, flexible competence management, team skills, and individual action competencies defined in terms of group dynamics. Underlying these efforts are very general administrative and institutional models as well as many pragmatic suggestions for action. As yet, there are no middle level theories that can fill the gaps between individual and collective competence models in institution-specific contexts.

2.7 Review of Related Empirical Studies

The study conducted by Sambo *et al.* (2013) showed that working experience or number of years spent with master craftsman affects the skills acquired by apprentice. To become a master craftsman, you need to have strong practical skills. You need to be good at problem-solving and faults detection. You also need to have good human

relations and great customer service skills. The Internet is even spreading to mechanics, with certified mechanics providing advice online. Mechanics themselves now regularly use the Internet for information to help them in diagnosing and/or repairing vehicles. Service manuals for vehicles have become significantly less prevalent with computers that are connected to the Internet taking their position (Jeffrey, 2015). In repairing cars, the main role of the mechanic is to diagnose the problem accurately and quickly. They often have difficulty in diagnosing electronic faults. Study shows that their job may involve the repair of a specific part or the replacement of one or more parts as assemblies (Funkhouser, 2013). Roadside mechanics have to compete with large companies which use expensive diagnostic equipment and have advantages in purchasing, distribution and marketing. Small companies can compete effectively by providing superior customer service or offering specialized services.

Jalal (2013) discovered from a skill gap analysis that majority of the mechanics in Nigeria lack the relevant knowledge about vehicle electrical and electronic components repair. Technology in the auto sector advances continually at a very fast pace. Most cars on our roads today are built with a lot of electronically controlled systems. The only way to catch up with this advancement is training and re-training. According to Edunyah, (2015) in the past few years, the auto industry in India has seen major changes in designs and special features, and keeping these cars maintained and on the road takes highly skilled technicians and mechanics to diagnose and fix problems. Mechanics are responsible for inspecting, repairing and maintaining cars, buses, trucks, motorcycles and other vehicles. In recent years, the systems and components of these vehicles have become more complex.

However, mechanics lack the skills to work not only with special tools and diagnostic equipment, but also with sophisticated electronics and computer systems (Kayemuddin

& Kayum, 2013). Unfortunately there seems to be inadequate mechanics who are experts in carrying out the right diagnosis which can save automotive owner's time and potentially a substantial amount of money. Few studies have been carried out to assess the skills of roadside mechanics. The few studies that were conducted in Ghana (Edunyah, 2015) did not include Tamale Metropolis, even though a good number of roadside mechanics can be found in Tamale.

According to Uwameiye (2014), roadside mechanics acquire skills. These practical skills only involved assembling of parts. These practical skills are mostly devoid of diagnostic skills and knowledge information. Because of this deficiency, apprentices were hardly able to perform any operations that are new to them, except those they have seen their master carry out. In the practice of skills, the recipients observe the master trainer perform the operations, and through imitation, the apprentices then practice the skills until they become proficient in them. Productivity was low in automotive workshops in Bangladesh as the service was rendered by hands and use tools and equipment which were mostly outdated and these old tools affected their ability to work on complex systems especially electronic and automatic transmission systems. The study further revealed that abundant labor is available in Bangladesh and as such all of these workshops used labor intensive technology.

2.8 Summary of Literature Review

Panel beater is a term utilized as a part of some Commonwealth countries to depict a man who repairs vehicle bodies back to their manufacturing plant state in the wake of having been harmed e.g., subsequent to being included in a collision (Wikipedia, 2015). They do this utilizing numerous abilities such as planishing as well as different other

metalworking operations, welding, utilization of putty fillers, and some more. The help of modern technology has made a huge change in getting the actual size and shape of various car parts, most panel beaters today normally go to internet and order advance books written by great engineering authors, who has wide knowledge about panel beating operation. Competency in panel beating work helps panel beaters to require the use of more complex and highly technological and special measuring equipment to analyze the actual sheet metal to be cut for replacement. There are various conflicts relating to their sites of operation. Major conflicts often rise when the panel beaters are required to move in order to give way for a planned development. This brings them into direct confrontation with urban authorities and land developers. Most of the spaces the panel beaters occupy have no tenure, and are not allocated and sanctioned by urban authorities.

An organized forum should be available for orientation about the legitimate allowance to operate on good site, so that panel beating service can be patronized. Often times, older vehicles parts are removed and transfered to replace another damaged part, this strategies limit the stress to start reconstruction parts. A number of panel beaters expressed views that only registered operators are given licensed to work at road side, the ensured some level of scrutiny and sanction of their business operations. There were substantial changes in vehicle manufacturing methods and vehicle design during the 1990s with the advances usually seen in high end vehicles flowing down to mass production. Technology continues to evolve and the increasing prevalence of hybrid, electric and hydrogen powertrains will change the face of the repair industry. These changes relate not simply to the fuel used to power the vehicle but overall vehicle design, such as in wheel electric motors, the change of body part when damage or customizing the body part into suitable form. In the future, if Nigeria can come up with

ideas in building good body parts, and will help to motivate those that would like to explore a way to manufacture indigenous engine that the car can work with.

CHAPTER THREE

3.0 RESEARCH METHODOLOGY

3.1 Research Design

The design that was used in carrying out this study is survey research design in which questionnaires will be use to obtain the opinion of the respondents that are metalwork teachers and panel beaters on the subject matter of the competencies needed by road-side panel beaters in the repair of automobile car body panels in Minna metropolis, Niger state. The survey research design was chosen as an appropriate method for the researcher as it seeks the opinion of respondents about the issue that affect their daily life, give room for researchers to study the group of people and items to source for information from the respondents (Babbie, 2014).

3.2 Area of the Study

This study covered some panel-beaters workshop in selected areas in Minna metropolis, Niger state. This includes Okada road, Mypa road (mechanic villa), Bosso road, Maitumbe, Kpakungun, Tunga, Chanchaga, Makunkele, Dutsen-kura, Western by-pass and Peugeot motors, all within Minna metropolises and five Government Technical College located Minna, Suleja, Bida, New Bussa and Pandogari. Minna is a developing town in Niger state and requires the need of competent panel beaters. Minna is the capital city of Niger state.

3.3 Population of the Study

The targeted population for this study consisted of the panel beater in Minna metropolis and Metalwork teachers in five Government technical colleges. Minna is a developing urban settlement, various panel beaters are not registered with appropriate body. Therefore accessible population was used, while 16 metalwork teachers located in technical colleges was used for the study. Population of metalwork teachers were obtained from science and technical schools board.

3.4 Sample and Sampling Technique

A stratified purposive sampling technique was used to sample the study, knowing that the entire population of panel beaters could not be ascertained, five (5) Master Panel Beaters were sampled from each unit of the study area identified above and Metalwork teachers from technical schools were also sampled. A sample of twenty five (25) Master Panel Beater and all the (16) Metalwork teachers was used for the study.

Table 3.1: Sampled Distribution

S/N	Technical Colleges	Metalwork Teachers	Panel Beaters
1	Government Technical college, Minna	4	5
2	Government Technical college Eyagi Bida	3	5
3	Mamman Technical college, Pandogari	3	5
4	Government Technical college, New Bussa	3	5
5	Suleiman Barau Technical College Suleja	3	5
	Total	**16**	**25**

Source: Authors' fieldwork (2022)

3.5 Instrument for Data Collection

The questionnaire will be the main instrument that will be used by the researcher collect data for the study. The research questions has two parts, Part one contains the personal data of the respondents in which part two is then sub-divided into three (3) sections A, B, C, which are:

Section A: this section contains 17 items dealing with the needed competencies of Road side panel beaters in the repair of automobile car parts in Minna metropolis, Niger state. Section B: contains 18 items dealing with challenges of panel beaters in repair of automobile car parts in Minna metropolis, Niger state. Section C: contains 20 items dealing with strategies that can enhance effectiveness in the competency of panel beaters in the repair of automobile car parts in Minna metropolis, Niger state.

The instrument uses four point likert rating scales which are: HN-Highly Needed (=4) SA-Strongly Agree (=4) MN-Moderately Needed (=3) A-Agree (=3) N-Needed (=2) D Disagree (=2) NN-Not Needed (=1) SD-Strongly Disagree (=1)

3.6 Validation of the Instrument

The instrument was validated by three lecturers in the Department of Industrial and Technology Education, Federal University of Technology Minna. The validate suggestion and correction was incorporated in the final draft of the instrument. This is to ensure that the instrument was capable of eliciting necessary information for the data needed for the study.

3.7 Method of Data Collection

The questionnaires for the study will be administered to the road side panel beaters and metalwork teachers by direct delivery technique, which is on the spot method. For those who cannot read and write, the researcher and two research assistants will interprete the questionnaire to the respondents and tick in the column of their options. The method adopted contributed to the high rate of returning of the questionnaire.

3.8 Method of Data Analysis

The data collected was analysed using mean, standard deviation and t-test. The statistical tools employed for the analysis include mean, standard deviation and t-test. Mean was used to answer the research questions while standard deviation will be the closeness of the responses of the respondents and t-test was employed to analyse the hypotheses. In order to determine the level of acceptance of the rejection of any item, a

mean score of 2.50 was used. Therefore any item with a mean response of 2.50 and above was accepted and any item with a mean response of 2.49 and below was rejected.

CHAPTER FOUR

4.0 RESULTS AND DISCUSSION

4.1 Research Question One

What are the needed competencies of Road side Panel Beaters in the repair of automobile car body parts? In this section, 17 items were offered to the respondent to make their opinions known.

Table 4.1

Mean responses of the Metalwork teacher and Master Panel Beater on the competencies needed by Panel beaters.

$N_1 = 25, N_2 = 16$

S/N	ITEMS	$\overline{X}_1$	SD_1	$\overline{X}_2$	SD_2	X_t	Remarks
	Ability to;						
1	Detect dent on a car at first glance and knowing the right tool to use	3.55	0.54	3.56	0.63	3.55	Needed
2	Obtain quality materials in relation to the job specification	3.56	0.54	3.63	0.62	3.59	Needed
3	Dismantle car parts and reassemble them properly without stress or problem	3.53	0.54	3.69	0.60	3.61	Needed
4	Select the most correct welding tip in relation to the job requirement	3.55	0.54	3.56	0.63	3.55	Needed
5	Work on the repair or change any car part irrespective of the manufacturer or designer of the car	3.51	0.54	3.69	0.60	3.60	Needed
6	Properly utilize fairly used car part and manipulate it on new dented cars	3.49	0.54	3.63	0.62	3.56	Needed
7	Create a workable environment in the workshop for both the apprentice and panel beater	3.60	0.53	3.63	0.62	3.61	Needed
8	Observe safety precautions when working on the car body	3.58	0.53	3.63	0.62	3.60	Needed
9	Improvise when the cost of working materials are expensive and to get the right alternative when needed	3.60	0.53	3.69	0.60	3.64	Needed

10	Work with the oxy-acetylene gas properly without causing accident in the workshop	3.56	0.54	3.56	0.63	3.56 Needed
11	Make use of the flashback arrestors so as to get a proper work done on the car body parts	3.53	0.54	3.69	0.60	3.61 Needed
12	Understand the nature of the automobile car part that needs to be worked on before working on them	3.51	0.54	3.63	0.62	3.57 Needed
13	Avoid damage tools from further damage of the car part to be repaired	3.56	0.54	3.69	0.60	3.63 Needed
14	Ensure accurate and proper alignment of some necessary parts of the car body panel when working on them	3.60	0.53	3.56	0.63	3.58 Needed
15	Ensure that all tools are kept in their rightful place for their efficiency	3.60	0.53	3.75	0.58	3.68 Needed
16	Ensure good welding techniques without creating welding defects	3.58	0.53	3.69	0.60	3.64 Needed
17	Adjust the welding flame properly to achieve the aims of joining specific car body parts together	3.55	0.54	3.75	0.58	3.65 Needed
	Grand Average	**3.56**	**0.54**	**3.65**	**0.61**	**3.60**

Key

N_1 = Number of Panel Beaters
SD_1 = Standard deviation of Panel Beaters
N_2 = Number of Metalwork teachers
SD_2 = Standard deviation of Metalwork teachers
X_1 = Mean of Panel Beaters
X_2 = Mean of Metalwork teachers
X_t = average mean of Panel beaters and Metalwork teachers

The data shown in table 1 makes it known that all the suggested competencies are needed by panel beaters with all the items having its mean score ranging from 3.55 to 3.68 and standard deviation ranging from 0.53 to 0.63

4.2 Research Question two

What are the possible challenges of panel beaters in repair of automobile car body parts? In this section, 18 items were presented to the respondent to express their opinions on possible challenges faced.

Table 4.2
Mean responses of the Metalwork teacher and Master Panel Beater on the challenges faced by Panel beaters.

$N_1 = 25$, $N_2 = 16$

S/N	ITEMS	$\bar{X}_1$	SD_1	$\bar{X}_2$	SD_2	X_t	Remarks
1	Tools needed for proper performance in the workshop are not available	3.45	0.60	3.56	0.63	3.50	Agreed
2	Panel beating tools are sold at an expensive rate, not convenient for the panel beater	3.51	0.57	3.38	0.72	3.44	Agreed
3	Accessible road available for customers to drive in their cars	3.49	0.64	3.50	0.73	3.50	Agreed
4	Sufficient workshop security to be able to keep expensive car against robbery	3.45	0.66	3.63	0.62	3.53	Agreed
5	Lack of trust by customers patronizing panel beater	3.53	0.57	3.44	0.73	3.48	Agreed
6	There is favoritism when performing your duty in the workshop	3.29	0.66	3.69	0.60	3.49	Agreed
7	Lack of competent apprentice who can work when not around due to unforeseen circumstances	3.51	0.57	3.56	0.63	3.54	Agreed
8	Level of hospitality shown to the customer by panel beaters is usually very low	3.53	0.54	3.50	0.63	3.51	Agreed
9	Unfriendly environment challenges from the community members	3.51	0.60	3.63	0.72	3.57	Agreed
10	There is shortage of alternative workshop tools that can be used for proper car body repairs	3.42	0.66	3.50	0.73	3.46	Agreed
11	Health challenges as a result of non-use of appropriate protective clothing	3.38	0.65	3.75	0.45	3.57	Agreed

12 Lateness to panel beating workshop by workers constitute major hindrance	3.40	0.63	3.56	0.63	3.48	Agreed
13 Improper maintenance habit been observed in the process of working and after working	3.42	0.60	3.38	0.72	3.40	Agreed
14 Lack of available car parts that are damaged in the process of repairing	3.56	0.57	3.69	0.60	3.63	Agreed
15 Distractions in the workshop affect the performance of the apprentice	3.46	0.57	3.63	0.72	3.54	Agreed
16 Lack of environmental friendly industries or workshops around the panel beating shop	3.51	0.54	3.81	0.54	3.66	Agreed
17 Non availability of fuel gas for welding car body parts	3.53	0.54	3.69	0.60	3.61	Agreed
18 Lack of standard painting room in the workshop	3.47	0.60	3.56	0.63	3.52	Agreed
Grand Average	**3.47**	**0.60**	**3.58**	**0.65**	**3.52**	

Key

N_1 = Number of Panel Beaters
SD_1 = Standard deviation of Panel Beaters
N_2 = Number of Metalwork teachers
SD_2 = Standard deviation of Metalwork teachers
X_1 = Mean of Panel Beaters
X_2 = Mean of Metalwork teachers
X_t = average mean of Panel beaters and Metalwork teachers

The data shown in table 2 shows all the challenges faced by panel beaters with all the items having its mean score ranging from 3.40 to 3.66 and standard deviation ranging from 0.45 to 0.73

4.3 Research Question three

What are the strategies that can enhance effectiveness in the competency of panel beaters in the repair of automobile car body parts? In this section, 20 items were

presented to the respondent to make their opinions known on ways to enhance effective competency of panel beaters.

Table 4.3

Mean responses of the Metalwork teacher and Master Panel Beater on ways to enhance Panel beaters competencies.

$N_1 = 25, N_2 = 16$

S/N	ITEMS	$\overline{X}_1$	SD_1	$\overline{X}_2$	SD_2	X_t	Remarks
1.	Creating conducive environment to work and also attract customers by the virtue of hospitality	3.91	0.29	4.00	0	3.96	Agreed
2	Continuous re-training and seminars to keep the panel beaters updated on the latest development	3.93	0.26	3.94	0.25	3.93	Agreed
3	Also train all apprentice on the knowledge acquired or gained in the course of trainings and seminars	3.95	0.23	3.94	0.25	3.94	Agreed
4	Align with other panel beaters in other to share knowledge and experience in difficult jobs	3.78	0.57	4.00	0	3.89	Agreed
5	Engage all knowledge about safety precaution in the workshop and to apply them	3.93	0.26	4.00	0	3.96	Agreed
6	Take proper care of the health situation of the apprentice and the master panel beater	3.91	0.29	3.94	0.25	3.92	Agreed
7	Use the best of the oxy-acetylene gas or get a close alternative	3.95	0.23	3.94	0.25	3.94	Agreed
8	Use tools and equipment in the workshop well and to keep them in good conditions	3.96	0.19	4.00	0	3.98	Agreed
9	Replace all damaged tools when due and use the right tool for the right job	3.96	0.19	3.94	0.25	3.95	Agreed
10	Inform the customer of the risk of	3.98	0.14	4.00	0	3.99	Agreed

working on the car parts and its chances of getting repaired						
11 Get a friendly environment to enhance proper work and reduce surrounding problems	3.98	0.14	3.94	0.25	3.96	Agreed
12 Get a spacious workshop to enhance movement and good ventilation	3.93	0.26	3.86	0.34	3.90	Agreed
13 Be constructive, creative and to use initiative when working with car parts	3.96	0.19	4.00	0	3.98	Agreed
14 Satisfy the apprentice by motivating them money-wise in the course of working to make them perform well	3.87	0.43	3.86	0.34	3.87	Agreed
15 By knowing every details of all the tools been used in the workshop without making mistake	3.87	0.39	3.86	0.34	3.87	Agreed
16 Use safety gadget correctly by putting it on every time at work	3.95	0.23	3.75	0.58	3.85	Agreed
17 Creating a well-ventilated and properly illuminated environment in the workshop	3.96	0.19	3.94	0.25	3.95	Agreed
18 Treating all customers with respect and to meet with the stipulated time given to them	3.98	0.14	4.00	0	3.99	Agreed
19 Keeping appropriate record of all activities in the workshop	3.87	0.43	3.94	0.54	3.91	Agreed
20 Provision of soft loan by government to panel beaters	3.98	0.14	3.94	0.25	3.96	Agreed
Grand Average	**3.73**	**0.26**	**3.94**	**0.21**	**3.94**	

Key

N_1 = Number of Panel Beaters
SD_1 = Standard deviation of Panel Beaters
N_2 = Number of Metalwork teachers
SD_2 = Standard deviation of Metalwork teachers
X_1 = Mean of Panel Beaters
X_2 = Mean of Metalwork teachers
X_t = average mean of Panel beaters and Metalwork teachers

The data shown in table 3 shows the possible ways to enhance the competencies of panel beaters with all the items having its mean score ranging from 3.85 to 3.99 and standard deviation ranging from 0 to 0.58

4.4 Hypothesis One

There is no significant difference between the mean responses of Master panel beaters and Metalwork teachers on the needed competencies of Road side panel beaters in the repair of automobile car body parts.

Table 4.4

t-test analysis of master panel beater and metal work teachers on the competencies needed by panel beater.

S/N	RESPONDENTS	N	$\overline{X}$	SD	d.f	t-cal	t-critical
1	Master panel beaters	25	3.56	0.54	39	-0.94	±1.99
2	Metalwork teachers	16	3.65	0.61			

Key
N_1 = Number of Panel Beaters
SD_1 = Standard deviation of Panel Beaters
N_2 = Number of Metalwork teachers
SD_2 = Standard deviation of Metalwork teachers
t = t-test value of panel beaters and teachers
S = Significant
NS = Not significant

The analysis in table 4 shows that the t-cal values of all the 17 items are needed. Therefore the null hypothesis was accepted for each of the items.

4.5 Hypothesis Two

There is no significant difference between the mean responses of Master panel beaters and Metalwork teachers on the needed strategies required to enhance effective competencies of Road side panel beaters in the repair of automobile car body parts.

Table 4.5

t-test analysis of master panel beater and metal work teachers on the strategies required to enhance effective competencies of panel beater.

S/N	RESPONDENTS	N	$\overline{X}$	SD	d.f	t-cal	t-critical
1	Master panel beaters	25	3.73	0.26	39	-5.25	±1.99
2	Metalwork teachers	16	3.94	0.21			

Key
N_1 = Number of Panel Beaters
SD_1 = Standard deviation of Panel Beaters
N_2 = Number of Metalwork teachers
SD_2 = Standard deviation of Metalwork teachers
t = t-test value of panel beaters and teachers
S = Significant
NS = Not significant

The analysis shown in table 5 makes it known that the t-cal values of all the 20 items are needed. Therefore the null hypothesis was accepted for each of the items.

Findings

The following findings were discovered based on the data collected and properly analyzed in accordance with the research questions selected for the study.

Findings related to the needed competencies of Road side Panel Beaters in the repair of automobile car body parts:

1. Should have very good welding techniques
2. Be able to work with the welding tools conveniently
3. Should dismantle and work on any car properly without problem
4. Get good and quality materials to suit the job specification
5. Observe safety precaution so as not to cause accident and affect health

Findings related to challenges of panel beaters in repair of automobile car body parts:

1. Expensive work tools and equipment
2. Health challenges
3. Insecurity in and around the workshop
4. Lack of standard painting room
5. Non availability of fuel gas for welding car body parts

Findings related to strategies that can enhance effectiveness in the competency of panel beater in automobile car body parts:

1. Getting updated by attending seminars and workshops
2. Team up with other panel beater to work
3. Use safety gadget ensure long lasting health
4. Ensure more security measures to secure cars in the workshop
5. Use good welding tools and utilize modern welding techniques
6. Government intervention by providing soft loan

4.6 Discussion of findings

The discussions of findings are based on the research questions and hypothesis posed for the study. The research findings shows that the respondents agreed with all the items listed out as the needed competencies of road side panel beaters. The questions indicate the needed competencies of road side panel beaters in the repair of automobile car body parts by knowing at first glance where needs to be touched or worked on. It also indicate that they should be able to know details about tools and equipment and know which is right for the job specification. Maintenance and safety measures must be properly understood by panel beaters. A panel beater should be able to conveniently dismantle a car because that will serve as the major criteria for his level of competency. A panel beater must also possess a very good welding technique which will not melt out the car parts and not result to blow holes.

According to research question 2, identified challenges that affect the performance of panel beaters. Findings revealed that tools and equipment are expensive for proper use in the workshop here in Minna metropolis. There is no proper security guaranteed in and around most workshop which is not good enough. Favouritism also set in as a challenge. Most panel beater are said to be non-hospitable in the course of running their business. Many panel beaters goes about their daily activities thereby ignoring their health and this later affect their health which causes them to breakdown. Lack of painting room has also affected the finishing of car part because it does not give the finish work of a car a perfect look after spraying as a result of dust and impurities that the surrounding air blows around

Based on the Table 3 and the research questions findings, it is discovered that all respondents agreed with all the items listed out as strategies that can enhance

effectiveness in the competencies of panel beaters. The findings discovered that government pick little or no interest in this selected career and it has given room for many irregularities thereby cost of car parts, panel beating tools nd equipment are expensive, no convenient space to establish workshop or mini-industry for this profession which can be tackled by government intervention of providing soft loan to panel beaters and government taking interest in the profession. There should be proper ventilation in the workshop which further help in improving the health situation of both the master panel beater and apprentice. There should be proper security measure to ensure that car theft are kept out of the workshop environment.

Hornsby (2014) defined competency as the ability to do something well. Competency is also known as the capability to apply or use a set of related knowledge, skills, and abilities required to successfully perform "critical work functions" or tasks in a defined work setting. As a panel beater, there is need for proper training in order to complete a trade apprenticeship (Tanaka, 2012)

The findings of this study under research question 3 show that some of the basic competencies needed by panel beaters are: use of safety attires (boots, gloves, eye goggle, etc.), possess skilful welding technique, have good maintenance culture etc. According to Aldrich, (2015) an apprentice capabilities are determined by his trainer's competencies. To attain competencies level, outdated equipment must be thrown out of the workshop to create room for modern tools and equipment and must be properly operated at when due and done rightly.

CHAPTER FIVE

5.0 CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

The main focus of this research study was to find out the needed competency of road-side panel-beaters. Three research questions were formulated for the study and two null hypothesis were also drawn. This study, revealed that there are several competencies needed by panel beaters and there are also various ways to improve their level of competencies so as to produce better results. It shows that if properly harnessed, there will be tremendous transformation and improvement with the way there work is been carried out and with time, there can be mini-companies for the production of Nigerian made car part as a result of properly mastered skills.

Taking a look at the research, most issues pertaining the level of competency has been worked on and the possible ways to improve them have also been suggested for improvement and implementation. Issues like unavailability of modern equipment, lack of working space, inability to keep health in good condition as a result of non-use of safety gadgets, security, use of outdated equipment and other can be tackled majorly by starting with the government involvement in the profession by providing grants and soft loans, provide training and creating agencies for research. Panel beaters can also improve by re-training themselves and getting useful materials from internet and by also working together without attaching money issues and sentiment to arrive at an excellent result by taking down the inventory record of all activities carried out.

In conclusion, this study shows that road side panel beater have a level of competencies, aside from the government intervening and showing interest in investing in these

profession, panel beater also needs to be worked on their skills by applying professional, intellectual, maintenance and safety skills to attain a level of perfection which are the main requirements needed to have a job done successful.

5.2 Recommendations

According to the research findings of this study and their implication, the following recommendation are important;

1. Panel beaters should participate in seminars and workshop organized by both government and non-government agencies for all panel beaters and apprentice which serves as a giant leap for the profession
2. Government should give out soft loans, provide grants and subsidies panel beating tools and equipment so as to beat down cost of its materials highly needed in the workshop
3. Government should set up an inspection team or agencies to look into the performance of panel beaters and to access them accordingly and find out how well the government loan and grants is been utilized judiciously
4. Safety precautions must be strictly adhered to ensure a long lasting health and reduce life threatening workshop accidents
5. Panel beaters should be competent in carrying out necessary operations on all automobile car body panels both in welding and activities surrounding it so as to improve effectiveness

5.3 Suggestion for further research

1. Evaluation of the effectiveness of the Roadside panel beaters tools and equipment used in Minna Metropolis.

2. Assessment of safe work habit and maintenance practices in metal workshop in technical colleges in Niger State.
3. Evaluation in the level of exposure of road-side panel beaters to new method and technologies use in the panel beating industry.

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QUESTIONNAIRE

FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA
SCHOOL OF SCIENCE AND TECHNOLOGY EDUCATION
DEPARTMENT OF INDUSTRIAL AND TECHNOLOGY EDUCATION

QUESTIONAIRE FOR THE COMPETENCIES NEEDED BY ROAD SIDE PANEL BEATERS IN THE AUTOMOBILE BODIES IN MINNA METROPOLIS

PART ONE

Introduction: the main objective of the research is to find out the competencies needed by road side panel beaters in the automobile body panel of automobile car body panels in Minna metropolis, Niger state.

Kindly complete this questionnaire with a sincere mind by ticking (√) on the appropriate column that represents your perception about the above topic.

All information gathered from this research will be treated confidentially and will be used for the research purpose.

PERSONAL DATA

INSTITUTION/PANEL BEATER SHOP

……..

Metalwork teacher ☐ Master Panel Beater ☐

A guide on how to tick (√) the questionnaire is shown below. The following rating scale is to be used in indicating your view by ticking the phrase that best portray level at which competencies are needed or not needed.

Please use the following scale to indicate your opinion:

Highly Needed (HN)	Strongly Agree (SA)
Moderately Needed (MN)	Agree (A)
Needed (N)	Disagree (A)
Not Needed (NN)	Strongly Disagree (SD)

PART TWO

SECTION A

What are the needed competencies of Road side panel beaters in the automobile body panel of automobile car body parts?

S/NO.	ITEMS	HN	MN	N	NN
1	Ability to; Detect dent on a car at first glance and knowing the right tool to use				
2	Obtain quality materials in relation to the job specification				
3	Dismantle car parts and reassemble them properly without stress or problem				
4	Select the most correct welding tip in relation to the job requirement				
5	Work on the automobile body panel or change any car part irrespective of the manufacturer or designer of the car				
6	Properly utilize fairly used car part and manipulate it on new dented cars				
7	Create a workable environment in the workshop for both the apprentice and the panel beater				
8	Observe safety precautions when working on the car body				
9	Improvise when the cost of working materials are expensive and to get the right alternative when needed				
10	Work with the oxy-acetylene gas properly without causing accident in the workshop				
11	Make use of the flashback arrestors so as to get a proper work done on car body parts				
12	Understand the nature of the automobile car part that needs to be worked on before working on them				
13	Avoid damage tools from further damage of the car part to be automobile body paneled				
14	Ensure accurate and proper alignment of some necessary parts of the car body panel when working on them				
15	Ensure that all tools are kept in their rightful place for their efficiency				
16	Ensure good welding techniques without creating welding defects				
17	Adjust the welding flame properly to achieve the aims of joining specific car body parts together				

SECTION B

What are the possible challenges of panel beaters in automobile body panel of automobile car body parts?

S/NO.	ITEMS	SA	A	D	SD
1	Tools needed for proper performance in the workshop are not available				
2	Panel beating tools are sold at an expensive rate, not convenient for the panel beater				
3	Accessible road available for customers to drive in their cars				
4	Sufficient workshop security to be able to keep expensive car against robbery				
5	Lack of trust by customers patronizing panel beaters				
6	There is favoritism when performing your duty in the workshop				
7	Lack of competent apprentice who can work when not around due to unforeseen circumstances				
8	Level of hospitality shown to the customers by panel beaters is usually very low				
9	Unfriendly environmental challenges from the community members				
10	There is shortage of alternative workshop tools that can be used for proper car body automobile body panels.				
11	Health challenges as a result of non-use of appropriate protective clothing				
12	Lateness to panel beating workshop by workers constitute major hindrance				
13	Improper maintenance habit been observed in the process of working and after working				
14	Lack of available car parts that are damaged in the process of automobile body paneling				
15	Distractions in the workshop affect the performance of the apprentice				
16	Lack of environmental friendly industries or workshops around the panel beating shop				
17	Non availability of fuel gas for welding car body parts				
18	Lack of standard painting room in the workshop				

SECTION C

What are the strategies that can enhance effectiveness in the competency of panel beaters in the automobile body panel of automobile car body parts?

S/NO.	ITEMS	SA	A	D	SD
1	Creating conducive environment to work and also attract customers by the virtue of hospitality				
2	Continuous re-training and seminars to keep the panel beaters updated on the latest development				
3	Also train all apprentice on the knowledge acquired or gained in the course of trainings and seminars				
4	Align with other panel beaters in other to share knowledge and experience in difficult jobs				
5	Engage all knowledge about safety precaution in the workshop and to apply them				
6	Take proper care of the health situation of the apprentice and the master panel beater				
7	Use the best of the oxy-acetylene gas or get a close alternative				
8	Use tools and equipment in the work-shop well and to keep them in good conditions				
9	Replace all damaged tools when due and use the right tool for the right job				
10	Inform the customer of the risk of working on the car parts and its chances of getting automobile body paneled				
11	Get a friendly environment to enhance proper work and reduces surrounding problems				
12	Get a spacious workshop to enhance movement and good ventilation				
13	Be constructive, creative and to use initiative when working with car parts				
14	Satisfy the apprentice by motivating them money-wise in the course of working to make them perform well				
15	By knowing every details of all the tools been used in the workshop without making mistake				
16	Use safety gadget correctly by putting it on every time at work				
17	Creating a well ventilated and properly illuminated environment in the workshop				
18	Treating all customers with respect and to meet with the stipulated time given to them				
19	Keeping appropriate record of all activities in the workshop				
20	Provision of soft loan by government to panel beaters				