

**ADVANCEMENT IN AUTOMOBILE INDUSTRY AND THE  
DIAGNOSIS AND REPAIR OF AUTO-TECHNICIANS IN MINNA  
METROPOLIS**

**BY**

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**2006/24439BT**

**A RESEARCH PROJECT SUBMITTED TO THE DEPARTMENT OF  
INDUSTRIAL AND TECHNOLOGY EDUCATION  
FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA, NIGER STATE.**

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

**SEPTEMBER, 2012.**

## **CERTIFICATION**

I SABA ALHASSAN AHMADU with matriculation No 2006/24439BT, 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**

.....

**Sign/Date**

**APPROVAL PAGE**

This project has been 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.

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## **DEDICATION**

This project work is dedicated to Almighty ALLAH for his good guidance and divine inspiration, strength and courage granted to make me from the start to the end of this programme in good condition.

## **ACKNOWLEDGEMENT**

Multitude of words cannot express how grateful I am to Almighty Allah for his guidance and protection throughout this degree program. My special gratitude goes to my able and understanding supervisor, Mall. A. Abdulkadir for his guidance. Despite numerous tasks, he created time to supervise this work and assist professionally. The head of department, Dr E.J Ohize, the project coordinator Mr. T.M.Moses Saba and my internal reader Mr J.F.Maigida for reading and correcting this project work. All the lecturers in the Industrial and Technology Education Department are not left out, I thank you all.

I own a special thanks to my father Mall. Alhassan Ahmadu, may ALLAH grant you paradise, Amen. My mother Mallama Aisha Mustapha whose prayer and support has been immeasurable to the success of my life.

I wish to express my profound gratitude to my brothers, Salihu Alhassan Ahmadu, Mohammed Ahmadu, and Idris Alhassan Ahmadu for their support given to me throughout the period of this programme.

I must express my gratitude also to my sisters, Fatimah Alhassan Ahmadu, Aisha Alhassan Ahmadu, Balikisu Alhassan Ahmadu, Hauwa Alhassan Ahmadu and Safiya Alhassan Ahmadu for the immeasurable support.

Finally, I wish to express my profound gratitude to my friend Isah Ibn Muhammad ibn-Sule, Ibrahim Isa Sakpe and also to my beloved Mallama Maryam Mohammed Abdulkadir and to all others who have contributed one way or the other to the success of this work. May God bless you all. Amen.

## **ABSTRACT**

This study investigated the advancement in the automobile industry and the diagnosis and repair faced by the auto technicians in Minna Metropolis, Niger State. Three research questions and three hypotheses were formulated to guide the study. The population of the study comprises 50 automobile master craftsmen and 100 auto technicians. The data collected from this study were analyzed using mean and t-test statistics were used. Mean was used to answer the research questions while t-test was used for testing the null hypotheses at 0.05 level of significance. The study recommended among others that Specialized skills are needed to work on these complex components in modern vehicles, there should be adequate training and re-training of auto technicians on modern technicians development. Technicians must have an increasing broad knowledge of how vehicles' complex components work and interact in a modern technology.

## TABLE OF CONTENT

Title page	i
Certification	ii
Approval page	iii
Dedication	iv
Acknowledgement	v
Abstract	vi
Table of content	vii
<b>CHAPTER ONE</b>	
<b>INTRODUCTION</b>	
Background of Study	1
Statement of Problem	4
Purpose of the Study	5
Significance of study	5
Scope of the Study	5
Assumptions of the Study	6
Research Questions	6
Hypothesis	6
<b>CHAPTER TWO</b>	
<b>LITERATURE REVIEW</b>	8
Technological Development in Automobile Industry	9
The Auto-technicians	11
Concept of Maintenance	13
Summary of Related Literature Review	14
<b>CHAPTER THREE</b>	

METHODOLOGY	15
Research Design	15
Area of the Study	15
Population of Study	15
Instrument for Data Collection	16
Validation of the Instrument	16
Administration of the Instrument	16
Method of Data Analysis	17
Decision Rule	17
<b>CHAPTER FOUR</b>	
PRESENTATION AND ANALYSIS DATA	18
Research Questions	18
<b>CHAPTER FIVE</b>	
SUMMARY, CONCLUSIONS AND RECOMMENDATIONS	
Summary of the study	32
Implications of the study	33
Conclusion	34
Recommendations	34
Suggestions for Further Study	35
REFERENCE	36



## **CHAPTER ONE**

### **INTRODUCTION**

#### **Background of the Study**

Advancement of Automobile describes the process of the continued improvement in automobile, and the application of knowledge. More commonly defined as the use of tools or processes developed along with civilization throughout the course of history. The Automobile industry is undergoing dramatic Changes. To meet worldwide competition, automakers have adopted challenging, technical and performance goals that stretch the limits of today's technology. The auto industry is one of the largest in the Nigerian informal sector. It includes a range of tradesmen such as auto-mechanics, auto-electricians, auto body mechanics, spare parts dealer, vulcanizers among others. Technologically, advancement has brought several changes and modifications in automobile system that are imported or assembled in Nigeria. Within this contest, Okorie (2001) noted that an important issue of workforce development in Nigeria is to ensure that human resources are developed for such an extent that the achievement of desired rate of technological changes will not be impeded through lack of personnel with suitable saleable skills. Thus, importation and the assemblage of automobile with new technological devices in Nigeria have implication for workforce development in automobile industries.

The uses of automobile vehicles on roads play 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 1995).

Maintenance has been defined as an activity applicable to all systems, natural and artificial to cause such systems to remain unaltered or unimpaired. It is the repair activity carried out on vehicles or other machineries to keep them unaltered, and if altered, to restore them to their original state. ( okah-Avae 19995, Akinola and Ogedengbe 2005).

The designs of vehicles have advanced to a very sophisticated level, and unlike the old mechanically operated vehicle systems, the modern vehicle are being operated and controlled by computerized electronic sensors. For example, latest vehicle ignition systems are electrically controlled without employing the old manually reset contact breaker. Common to majority of the electronic gadgets that sense instant faults in the vehicle and immediately notifies the driver through the dashboard display. The modern trend of mechanical services therefore requires the use of more complex and highly technological and special diagnostic equipment to analyses vehicles fault for repair and services. To ensure the needed efficiency, safety, comfort and style, competent professional hands are required (Auto Tips 2001; Dhillon 1980).

As vehicle technology and maintenance processes are advancing, the problems facing Automobile technicians in discharging their duties is becoming more complicated and more difficult, and hence affecting all the automobile systems in the country. Some of the results of the auto-technician problems include such as unpredictable breakdown of vehicle on the highways, failure of vehicle part such as brakes; resulting in accidents and loss of lives, delay and failure of important appointments, and heavy debts incurred by many car owners on maintenance. The function of auto-technicians, among others include inspect, maintain and repair automobiles. Perform basic care maintenance, such as oil changes and tire rotations, diagnose more complex

problems, and execute vehicle repairs. Auto-technicians responsibilities have evolved from simple mechanical repairs to high-level technology related work. Today, integrated electronic systems and complex computers regulated vehicles and their performance while on the road. This increasing sophistication and automobiles requires workers who can use computerized shop equipment and work electronic components while maintaining their skills with traditional hand tools. Auto-technicians must have an increasingly broad knowledge of how vehicles' complex components work and interact. They also must be able to work with electronic diagnostic equipments and digital manuals and reference materials.

The recent changes in automobile industries brought about the need for very efficient and effective maintenance. Often times, the garages where the maintenance activities are carried out are of low capital base and their establishments are either located on slippery terrains, under tree sheds, canopy made of banana or palm fronds, among others.

Similarly, a close look at the equipment being used reveals the level of poverty of these technicians. In most places, service pits are not available and where available, there is no reinforcement at the side to hold loose sands in place. No accuracy of either wheelbalancy or alignment could be obtained. New vehicles are the result of technological development, which calls for literate hands to handle.

A system with an optimum performance can be generated if all problems identified are tackled (lindley, et al. 1977; jarett 1977; Groover 1992). This will go a long way in alleviating the problems being encountered by the auto technicians due to the recent development in automobile industries.

With all these facts, there is the need for a thorough analysis of the existing practice and a synthesis of a existing practice and a synthesis of a comprehensive and management oriented practice to put the maintenance

culture as what it should be. It is against all these facts that this study was undertaken.

### **Statement of Problem**

The influence of technological advancement seem to have rendered traditional skills inadequate for the workplace while creating need for new and often sophisticated skills. In the automobile industry, there have been complex changes in the systems and components of automobiles that are imported or assembled in Nigerian. Recent developments in automobile have brought about changes in the skills required by auto-mechanics craftsmen in the automobile industry. However, most of these new developments in automobile components and systems are more complex. Therefore, auto-technicians' responsibilities have evolved from simple mechanical repairs to high-level technology-related work. Today, integrated electronic systems and complex computers regulate vehicles and their performance while on the road.

This increasing sophistication in automobile requires workers who can use computerized shop equipment and work with electronic components while maintaining their skills with traditional hand tools. Auto-technicians must have an increasingly broad knowledge of how vehicles complex components work and with electronic diagnostic equipment and digital manuals and reference.

Materials, however, auto-technicians seem to be contending with challenges posed by this modern technology. This may be responsible for auto-technicians' inability to adequately diagnose and solve problems related to automobile.

## **Purpose of the Study**

The purpose of this study is to investigate the diagnosis and repair faced by the auto- technicians' due to the advancement in automobile industry.

Specifically, the study will seek to identify

1. The modern technological advancement in automobile in industry.
2. The challenges face by technological advancement.
3. The way of overcoming these challenges.

## **Significance of the Study**

The findings of this study will be of immense benefits to the auto-technicians and also will hopefully influenced the future trends of the development in automobile content of motor vehicles mechanic in Nigeria the society will benefit from the more efficient and effective service to be rendered by the auto-technicians in Nigeria that will pass through an improved skills development training on the advancement in the automobile technology. The result will also allow instructor of motor vehicles mechanic work to indentify their areas of inefficiency on which they may need to update their knowledge.

Finally the result of the study will help the auto-technicians to know the areas in which they needed to be equipped with relevant automobile work skills, knowledge, tools and material needed in other to be able to cope with the trend in the recent development in the automobile industry.

## **Scope of the Study**

This study is delimited to the modern technological development in automobile industry, challenges faced by technological advancement and ways of overcoming these challenges.

### **Assumptions of the Study**

The following assumptions were stated for the study

1. The auto technicians are in better position to procreate valid answers to the questions posed for this study.
2. The respondents are in better position to identify strategies for implementing technological advancement in automobile industries and Diagnosis and Repair faced by auto-technicians in Minna metropolis, Niger state.

### **Research Questions**

1. What are the modern technological advancement in automobile industries?
2. What is the diagnosis and repair faced by auto-technicians as a result of these modern technological advancement?
3. What are the ways of overcoming this diagnosis and repair faced by auto-technicians?

### **Research Hypotheses**

The following null hypothesis were formulated and tested at 0.05 level of significant.

**H<sub>01</sub>** = There is no significance difference in the means response of auto-technicians and

car owners on current state of development in automobile industries in Minna metropolis.

**H<sub>02</sub>** = There is no significance difference in the mean response of auto-technicians and car owners or problem affecting technicians on developments in automobile industries in Minna metropolis.

**H<sub>03</sub>** = There in no significance difference in the mean response of auto-technicians and car owners on strategies to adopt in overcoming the problems affecting Technicians and development in automobile industries in Minna metropolis.

## **CHAPTER TWO**

### **LITERATURE REVIEW**

The review of literature is organized under the following sub headings:

1. History of Automobile Industry
2. Technological Advancement in Automobile industry
3. The Auto technicians
4. Concept of Maintenance
5. Summary of related Literature Reviewed

#### **History of Automobile Industry**

In the year 1769, a French engineer by the name Nicolas J. Cugnot invented the first automobile to run on roads. This automobile, in fact, was a self-powered, three-wheeled, military tractor that made use of a steam engine. The range of the automobile, however, was very brief and at the most, it could only run at a stretch for fifteen minutes. In addition, these automobiles were not fit for the roads as the steam engines made them very heavy and large, and required ample starting time. Oliver Evans was the first to design a steam engine driven automobile in the U.S.

A Scotsman, Robert Anderson, was the first to invent an electric carriage between 1832 and 1839. However, Thomas Davenport of the U.S.A. and Scotsman Robert Davidson were amongst the first to invent more applicable automobiles, making use of non-rechargeable electric batteries in 1842. Development of roads made travelling comfortable and as a result, the short ranged, electric battery driven automobiles were no more the best option for travelling over longer distances.

Charles Kettering's invention of the electric starter in 1912, turned the process of starting automobiles more faster and easier at the same time, doing away with the hand tools. Crude oil being discovered in Texas, the automobiles



driven by engines that ran on gasoline became even more affordable, as the prices of gasoline reduced. The prices of electric automobile were gone through a constant rise, in spite of the fact that these were less efficient than the gasoline automobiles.

Jean Joseph Etienne Lenoir was the first to invent an internal combustion engine that ran on petroleum and attached it to a three-wheeled carriage, and successfully traversed a distance of fifty miles in 1863.

Kari Benz manufacture the first automobile ( a three-wheeled car ) that affordable and compatible for travelling over long distances for its internal combustion engine that ran on gas, In 1886. Later in 1887, Gottlieb Daimler was the first to invent the predecessor of the modern automobile with an engine that had a vertical cylinder in addition to a gasoline driven carburetor. First building two-wheeled automobile (“Reitwagen”), Daimler was again the first to build a four-wheeled automobile in 1886.

The engines manufacture by Daimler was improved upon and these portable and fast engines made automobiles the way we see them today.

The advanced engines turned the slow, expensive automobiles of the yesteryears, a thing of the past, and cars became more affordable as both the prices of gasoline and petroleum as well as the manufacturing costs reduced through their mass manufacture at the assembly lines of factories.

Penhard and Levassor in 1889, and Peugeot in 1991 become the earliest mass manufacturers of the modern automobile.

### **Technological Advancement in Automobile Industry**

Technological Advancement describes the process of the continued improvement of technology, the application of knowledge, more commonly

defined as the use of tools or processes developed along with civilization throughout the course of history.

The modern automobile is a complex technical system employing subsystems with specific design functions. Some of these consist of thousands of component parts that have evolved from breakthroughs in existing technology or from new discoveries such as electronic computers, high-strength plastics, and new alloys of steel and nonferrous metals, as well as from factors such as air pollution, safety legislation, and foreign competition.

New designs have been brought into the market more quickly in recent years than in the past to permit manufacturers to capitalize on their proprietary technological advances. With more than 30 million new units built each year worldwide, manufacturers have been able to split up the total into many very small segments that nonetheless remained economical to market.

New technological advancement are recognized to be the key to successful competition. Research and development engineers and scientists have been employed by all automobile manufacturers and suppliers to improve the car body, Chassis, engine, drive train, vehicle control systems, occupant safety, and environmental emissions, and further work by the industry is necessary to meet the needs of the 21<sup>st</sup> century.

Vehicle design depends to a large extent on its intended use. Automobile for off-road use in countries that lack service facilities must be durable, simple systems with high resistance to severe overloads and extremes in operating conditions. Conversely, the customers for products that are intended for the high-speed, limited-access road systems in Europe and North America expect more passenger comfort options, increased engine performance, and optimized high-speed handling and vehicle stability. Stability depends principally on the distribution of weight between the front and rear wheels, the height of the center of gravity and its position relative to the aerodynamic center of pressure of the

vehicle, suspension characteristics, and whether front or rear wheels are used for propulsion. Weight distribution depends principally on the location and size of the engine. The common practices of front-mounted engines exploit the stability that is more readily achieved with this layout. The development of aluminum engines and new manufacturing processes has, however, made it possible to locate the engine at the rear without necessarily compromising stability.

### **The Auto-technicians**

An Auto technician is a skilled person who specializes in automobile maintenance, repair, and sometimes modification. Auto technicians may be knowledgeable in working on all part of a variety of car makes or may specialize either in a specific area or in a specific make of car. In repairing cars, their main role is to diagnose the problem accurately and quickly. They often have to quote prices for their customers before commencing work or after partial disassembly for inspection. The mechanic uses both electronic means of gathering data as well as their sense. Their job may involve the repair of a specific part or the replacement of one more part as assemblies.

Many of these Auto technicians are ex-workers of the multinational auto companies. Others are the products of the apprenticeship training programme of the informal sector. The primary modes of admission into these letter programmes parental/guardian recommendation and oral interview, and there is basically no written curriculum for training the apprentices.

Auto technician's responsibilities have evolved from simple mechanical repairs to high-level technology-related work. Today, integrated electronic systems and complex computers regulate vehicles and their performance while on the road. This increasing sophistication of automobiles requires workers who can use computerized shop equipment and work with electronic components while maintaining their skills with traditional hand tools. Technicians must have an increasingly broad knowledge of how vehicles' complex components work

and interact. They also must be able to work with electronic diagnostic equipments and digital manuals and reference materials.

When mechanical or electronic troubles occur in a vehicle, technicians first get a description of the problem from the owner. To locate the problem, technicians use a diagnostic approach. First, they test to see whether components and system are secure and working properly. Then, they isolate the components or systems that might be the cause of the problem. For example, if an air-conditioner malfunctions, the technician might check for a simple problem, such as a low coolant level, or more complex issue, such as a bad drive-train connection that has shorted out the air conditioner. As part of their investigation, technicians may test drive vehicle or use a variety of testing equipment, including onboard and hand-held diagnostic computer or compression gauges. During routine service inspections, technicians test and lubricate engines and other major components. Sometimes, technicians' repairs or replace worn parts before they cause breakdowns or damage the vehicle. Service technicians use a variety of tools in their work. They use power tools, such as pneumatic wrenches, to remove bolts quickly, machine tools like lathes and grinding machines to rebuild brakes; welding flame-cutting equipment to remove and repair exhaust system; and jacks and hoists to lift cars and engines. They also use common hand tools, such as screwdrivers, pliers, and wrenches to work on small part and in hard-to-reach places.

With the rapid advancement in technology, the technician's job has evolved from being purely mechanical to including electronic technology. Because vehicles today possess complex computer and electronic systems, auto technicians need to have a broader base of knowledge than in the past. Lately, the term "auto mechanic" is being used less and less frequently and is being replaced by the euphemistic title "automotive service technician" fading quickly

is the day of the shade tree mechanic, who needed little knowledge of today's computerized systems.

Due to the increasingly labyrinthine nature of the technology that is now incorporated into automobiles, most automobile dealerships now provide sophisticated diagnostic computer to technician, without which they may be not be able to diagnose or repair electronic issues in modern vehicles.

Computers are also commonplace in modern repair shops, high technology tools are needed to fix the computer equipment that operates everything from the engine to the radio in many cars. In fact, today, most automotive systems, such as braking, transmission, and steering systems, are controlled primary by computers and electronic components due to the recent technological development in automobiles industries. Additional, luxury vehicles often have integrated global positioning systems, accident-avoidance systems, and other new feature with which technicians will need to become familiar. Also, as more alternate-fuel vehicle are purchased, more automotive service technicians will need to learn the science behind these recent automobiles and how to repair them. Today's automotive technician must master a world where electronic calls the tune. It's a far different world than we knew even a dozen years ago. But in the end, the solution lies where it always has: in the hands, the tools and the knowledge of the technician.

### **Concept of Maintenance**

Maintenance had been defined as an activity applicable to all systems, natural and artificial, to cause such systems to remain unaltered or unimpaired. It is the repair activity carried out on vehicles or other machineries to keep them unaltered, and if altered, to restore them to their original state.(Okah-Avae 1995, Akinola and Ogedengbe 2005).

Basic vehicle maintenance is a fundamental part of a mechanic's work in some countries, while in others they are consulted only when a vehicle is already showing signs of malfunction. Preventative maintenance is also a fundamental part of a mechanic's job, but this is not possible in the case of vehicles that are not regularly maintained by a mechanic. One misunderstood aspect of preventative maintenance is scheduled replacement of various parts, which occurs before failure to avoid far more expensive damage. Because this means that parts replace before any problem is observed, many vehicle owners will not understand why the expense is necessary.

### **Summary of Related Literature Review**

The review of literature revealed that Technological advancement describes the process of the continued improvement of technology, the use of tools or processes developed along with civilization throughout the course of history. The modern automobile is a complex technical system employing subsystems with specific design functions. Some of these consist of thousands of component parts that have evolved from breakthroughs in existing technology or from new discoveries. High technology tools are needed to fix the computer equipment that operates everything from the radio in many cars. Also, as more automobiles vehicle are purchased, more auto technicians will need to learn the science behind these recent automobiles and how to repair them. Today's auto technicians must master a world where electronic calls the tune. It's a far different world than we knew even a dozen years ago. But in the end, the solution lies where it always has, in the hands, the tools and the knowledge of technician.

## **CHAPTER THREE**

### **METHODOLOGY**

This chapter describes the research design, area of the study, population of the study, instrument for data collection, validation, and administration of the instrument and method of data analysis.

#### **Research Design**

In carrying out this study the survey design was used. The survey is considered the best design for this study because of the type of information needed for this research. Nworgu (1991) stated that a research design is a plan or blueprint which specifies how data relating to a given problem should be collected and analyzed. This study sought the opinion of management and technician's personnel in automobile workshops in Minna metropolis on technological advancement in Automobile industry and Diagnosis and Repair of auto technicians in Minna Metropolis.

#### **Area of the Study**

The study was carried out in all auto mechanic workshops in Minna metropolis of Niger State.

#### **Population of Study**

The targeted population for this study uses 150 respondents consisting of 50 master crafts and 100 apprentices. The entire population Hence was used. There was no sampling.

## **Instrument for Data Collection**

The instrument for data collection was a structured questionnaire developed by the researcher. It consist the introductory part and divided into three sections.

**Section A:** contain 20 items which identified the current state of technological advancement in automobile industries and diagnosis and repair faced by auto technicians.

**Section B** contains 10 items which sought opinion on the diagnosis and repair faced by auto technicians as a result of these modern technological advancement in automobile industries.

**Section C:** contains 10 items which identified the strategies to adopt in overcoming the challenges faced by auto technicians as regarding the modern technological development in automobile industries.

## **Validation of the Instrument**

The questionnaire was validated by the lecturers in the department of Industrial Technology and Education, Federal University of Technology, Minna, Niger State.

## **Administration of the Instrument**

The researcher administered the questionnaires to the respondent personally, with the help of research assistants. The administered questionnaire was later collected after completion. About 90% was the collection rate.



## **Method of Data Analysis**

To analyze the data, frequency count, mean and t-test statistics were used. Mean was used to answer the research questions while t-test was used for testing the null hypotheses formulated at 0.05 level of significant.

## **Decision Rule**

To determine the acceptance level, a mean score of 2.50 is computed in line with four point rating scale. Any item with a mean of 2.50 and above was considered AGREED and any item below 2.50 was DISGREED. The acceptance level for the hypotheses testing is base on the degree of freedom ( $df = n_1 + n_2 - 2$ ) of 58 degree which gives a t-table value at .05 level of confidence of = 1.98. Therefore any item with t- calculated value less than =1.98 was accepted *while those equal or greater than =1.98 was rejected*

## CHAPTER FOUR

### PRESENTATION AND ANALYSIS DATA

This chapter deals with the presentation and analysis of data with respect to the research questions and hypotheses formulated for this study, the result of data analysis for the research questions were presented first, followed by those of the hypotheses tested for the study.

#### Research Question 1

What is the state of Advancement in automobile industry?

**Table 1**

**Mean response of master craftsmen and apprentice personnel on current state of technological Advancement in automobile industry**

**N<sub>1</sub>=35, N<sub>2</sub>=70**

S/N	Items	X <sub>1</sub>	X <sub>2</sub>	X <sub>t</sub>	Remark
1.	Modern vehicles are being operated and controlled by computerized electronic sensors.	3.20	3.06	3.13	Agreed
2.	The modern mechanical services the use of more complex and highly technological and special diagnostics equipment.	1.78	1.89	1.84	Disagreed
3.	Modern vehicles' ignition system are electrically controlled.	3.72	3.58	3.65	Agreed
4.	The brain box sense detects instants faults in the Modern vehicles and notifies the driver through the dashboard display.	3.25	3.50	3.43	Agreed
5.	Some modern vehicles use direct ignitions system without the use of distributor.	2.25	2.00	2.21	Disagreed
6.	Integrated electronic systems and complex computers regulate modern vehicles and their	3.25	3.50	2.86	Agreed

	performance while on the road.				
7.	Modern vehicles have remote control Devices.	3.75	2.50	3.25	Agreed
8.	Modern automotive systems, such as braking, transmission and steering systems, are controlled primarily by computers and electronic components.	2.75	2.15	2.71	Agreed
9.	Modern vehicle bodies are lighter in Weight.	3.00	2.50	2.35	Disagreed
10.	Modern cars feature global positioning Systems, Bluetooth wireless connections and multiple airbags.	3.75	3.08	3.33	Agreed
11.	Sophisticated electronics cars and trucks are good in fuel economy.	3.26	3.01	2.88	Agreed
12.	Modern vehicles does not use manual gears like the old mechanical operated system.	1.89	1.72	1.81	Disagreed
13.	There are computers in modern vehicles.	1.72	3.36	2.54	Agreed
14.	Electronics have replaced mechanical system in the modern vehicles.	1.89	1.85	1.87	Disagreed
15.	The engine performance has increase in modern vehicles.	3.26	3.06	3.13	Agreed
16.	Various engine modifications that alter emission characteristics have been introduce in the modern vehicles.	1.83	3.22	2.42	Disagreed
17.	Installation of protective device such as airbag in modern car .	1.38	1.58	1.48	Agreed
18.	Unique designs of the modern vehicles.	1.45	1.53	1.47	Disagreed
19.	Modern vehicles have alarms and full security to safeguard it from thieves.	1.35	1.56	1.43	Agreed
20.	A computer device used in detecting faults in modern vehicle.	3.26	3.06	3.12	Agreed

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## Keys

$N_1$  = Number of Master craftsmen -  $X_1$  = Mean of master craftsmen

$N_2$  = Number of Apprentice -  $X_2$  = Mean of Apprentice

$X_1$  = Average mean of master craftsmen and Apprentice

The data presented in table 1 shows that the respondents agreed with items, 1.3.13 and 16 with mean score ranging between 3.13-3.65, and disagreed with the remain items with mean score ranging between 1.43-2.42 respectively.

## RESEARCH QUESTION 2

What are the challenges face by auto-technicians as a result of these modern Advancement in automobile industries?

**Table 2**

**Mean response of apprentice and master craftsmen on the challenges faced by auto-technicians as a result of modern Advancement in automobile industry.**

$N_1=35, N_2=70$

S/N	Items	$X_1$	$X_2$	$X_t$	Remark
1.	Specialized skills are needed to to work on these complex components in modern vehicles.	3.58	3.39	3.49	Agreed
2.	Most auto technicians have poor educational background to interprete electronic circuit.	3.72	3.58	3.65	Agreed
3.	Technicians have inadequate knowledge of how complex vehicles components work and interact.	3.60	3.51	3.55	Agreed
4.	There's inadequate modern	3.43	3.29	3.36	Agreed

	maintenance and other diagnostic equipment facilities.				
5.	Advancements in technology cause auto technicians to continuously be learning and improving on new methods of repair.	3.55	3.56	3.56	Agreed
6.	Most auto technicians lack funds to procure modern diagnostic equipments.	3.58	3.38	3.48	Agreed
7.	Modern vehicle component parts are not easily accessible.	3.43	3.38	3.48	Agreed
8.	The diagnosis of electrical systems has become a core skill for auto technicians.	3.52	3.58	3.55	Agreed
9.	The increasing sophistication of automobiles requires workers who can use computerized shop equipments and work with electronic components.	3.38	3.36	3.37	Agreed
10.	The modern automobile vehicle is Complex with specific design functions.	3.18	3.36	3.20	Agreed

### Key

$N_1$  = number of master craftsmen -  $X_1$  = mean of master craftsmen

$N_2$  = Number of apprentice -  $X_2$  = mean of apprentice

$X_1$  = average mean of master craftsmen and apprentice personnel

The data presented in table 4 shows that the respondents agreed with all the items mean score ranging between 3.20-3.65.

### Research Question 3

What are ways of remedy the challenges face by auto-technician?

**Table 3**

**Mean Response of master craftsmen and apprentice on strategies to adopt what ways of remedy the Diagnosis and Repair face by auto-technicians.**

**$N_1=35, N_2=70$**

S/N	Items	$X_1$	$X_2$	$X_t$	Remark
1.	Educating Auto technicians through the organization of seminars and workshops.	3.66	3.52	3.58	Agreed
2.	Adequate training and re-training of auto technicians on modern technological development.	3.43	3.36	3.40	Agreed
3.	Availability of modern vehicle spare parts.	3.46	3.30	3.38	Agreed
4.	Availability of modern maintenance and Other diagnostic equipment facilities in their workshop.	3.38	3.29	3.34	Agreed
5.	Constant electricity power in the workshops.	3.29	3.28	3.29	Agreed
6.	Employment of foreign investor with modern technological skills in to the country to train more auto technicians.	3.43	3.5	3.47	Agreed
7.	Availability of technicians to work with electronic diagnostic equipment and digital manuals and reference materials.	3.29	3.22	3.26	Agreed
8.	Effective maintenance of modern equipment and tools by auto technicians.	3.23	3.2	3.22	Agreed
9.	Usage of modern diagnostic equipment and tools by	3.15	3.33	3.24	Agreed

the auto technicians.				
10. Workshop should be clean and have ventilation.	3.66	3.6	3.63	Agreed

### Key

$N_1$ =Number of master craftsmen - $X_1$ =Mean of master craftsmen

$N_2$ =Number of apprentice - $X_2$ =Mean of apprentice

$X_1$ =Average mean of spare parts dealers and apprentice.

The data presented in table 3 shows that the respondents agreed with all the items with mean score ranging between 3.29-3.84.

### Hypothesis 1

There is no significant difference in the mean response of master craftsmen and apprentice on current state of Advancement in automobile industry and Diagnosis and Repair face by auto technicians in Minna metropolis, Niger state.

**Table 4: t-test analysis of the respondent regarding the current state of Advancement in automobile industry and Diagnosis and Repair faced by auto-technicians in Minna metropolis, Niger state.**

$N_1=35, N_2=70$

S/N	Items	S.D <sub>1</sub>	S.D <sub>2</sub>	t-test	Remarks
1.	Modern vehicle are being operated and controlled by computerized electronic sensors.	0.53	0.86	1.03	NS
2.	The modern mechanical services require the use of more complex and highly technological and special diagnostic equipment.	0.96	0.94	0.56	NS
3.	Modern vehicles ignition systems are electrically controlled.	0.46	0.5	1.43	NS
4.	The brain box sense detects	0.61	0.81	1.56	NS

instant faults in the modern vehicle and notifies the driver through the dashboard display.				
5. Some modern vehicles use direct ignition system without the use of distributor.	0.78	0.85	0.31	NS
6. Integrated electronic systems and complex computers regulate modern vehicles and their performance while on the road.	0.9	1	0.32	NS
7. Modern vehicles have remote control device.	0.85	0.89	0.4	NS
8. Modern vehicles systems, such as braking, transmission, and steering system, is controlled primarily by computers and electronics components.	0.65	0.55	0.55	NS
9. Modern vehicle bodies are lighter in weight.	0.68	0.71	1.4	NS
10. Modern cars feature global positioning systems, bluetooth wireless connections and multiple air bags.	0.53	0.83	1.5	NS
11. Sophisticated electronics cars and trucks are good in fuel economy.	0.65	0.76	1.62	NS
12. Modern vehicles does not use manual gears like the old mechanical operated system.	0.86	0.76	1.00	NS
13. There are computers in modern vehicles.	0.46	0.62	15.27	S



14.	Electronics have replaced mechanical system in the modern vehicles.	0.71	0.79	0.27	NS
15.	The engine performance has increase in modern vehicles.	0.53	0.86	1.03	
16.	Various engine modifications that alter emission characteristics have been introduced in the modern vehicles.	0.51	0.85	8.79	
17.	Installation of protective device such as air bag in the modern car.	0.68	0.71	1.4	
18.	Unique designs of the modern vehicles.	0.6	0.68	1.01	
19.	Modern vehicles have alarms and full security to safeguard it from thieves.	0.63	0.77	1.07	
20.	A computer device used to detects faults in modern vehicle.	0.60	0.67	1.88	

### Key

$\bar{X}_1$ =Mean of master craftsmen,  $SD_1$  = Standard Deviation of master craftsmen

$\bar{X}_2$ = Mean of apprentice,  $SD_2$  = Standard of apprentice

T=t-test calculated, NS= Not Significant, S= Significant

Table 4 reveal that 13 and 16 were rejected indicating that there is a significant difference between the option of apprentice and master craftsmen. The t-calculated are greater than t-critical value of +1.98 at .05 level of significance.

While remain items were accepted indicating that there is no significant difference between the respondent hence null hypothesis stated is accepted.

## **Hypothesis 2**

There is no significant difference in mean response of master craftsmen and apprentice on the challenges face by auto-technicians as a result of these modern development in automobile industries.

**Table 5:t-test Analysis of the Respondent regarding the challenges face by auto-technicians as a result of these modern Advancement in Automobile industries in Minna Metropolis, Niger state.**

N <sub>1</sub> =35,N <sub>2</sub> =70					
S/N	Items	S.D <sub>1</sub>	S.D <sub>2</sub>	t-test	Remark
1.	Specialized skills are needed NS to work on these complex components in modern vehicle.	0.5		0.49	1.85
2.	Most auto technician have poor educational background to interpret electronic circuit.	0.46	0.5	1.43	NS
3.	Technicians have inadequate knowledge of how complex vehicle components work and interact.	0.49	0.5	0.98	NS
4.	There's inadequate modern maintenance and other diagnostic equipment facilities. NS	0.5		0.46	1.39
5.	Advancement in technology NS cause auto-technicians to continuously be learning and improving on new methods of repairs.	0.5		0.5	0.1
6.	Most auto technicians lack funds to procure modern diagnostic equipments. NS	0.5		0.49	1.95
7.	Modern vehicle component parts area not easily accessible. NS	0.5		0.5	-0.97
8.	The diagnosis of electrical systems has become core skill for auto technicians. NS		0.5	0.5	-0.58

9.	The increasing sophistication NS of automobiles requires workers who can use computerized shop equipments and work with electronic components.	0.49	0.48	0.2
10.	The modern automobile NS vehicle is complex with specific design functions.	0.74	0.56	0.2

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### Keys

$X_1$  = Mean of master craftsmen,  $SD_1$  = Standard Deviation of master craftsmen

$X_2$  = Mean of apprentice,  $SD_2$  = Standard of Deviation of apprentice.

T = t-test calculated, NS = Not Significant, S = Significant

Table 5, reveal that all the items were accepted indicating that there is no significant difference between the respondents hence null hypothesis stated is accepted

### Hypothesis 3

There **is** no significant difference in the mean response of auto apprentice and master craftsmen on strategies to remedy the challenges faced by auto technicians in automobile industry.

**Table 6: t-test Analysis of the Respondent regarding the strategies to remedy the challenges faced by auto technicians in automobile industry.**

**N<sub>1</sub>=35,N<sub>2</sub>=70**

<b>S/N</b>	<b>Items</b>	<b>S.D<sub>1</sub></b>	<b>S.D<sub>2</sub></b>	<b>t-test</b>	<b>Remark</b>
1.	Educating auto-technicians though the organization of seminars and workshops.	0.48	0.5	1.59	NS
2.	Adequate training and NS re-training of auto-technicians on modern technological development.	0.5	0.48	0.69	
3.	Availability of modern vehicle spare parts.	0.5	0.46	1.59	NS
4.	Availability of modern maintenance and other diagnostic equipment facilities in their workshop.	0.49	0.46	0.91	NS
5.	Constant electricity power in the workshops.	0.46	0.45	0.11	NS
6.	Employment of foreign investor with modern technological skills into the country to train more auto technicians.	0.5	0.5	-0.68	NS
7.	Ability of technician must be able to work with electronics diagnostic equipment and digital manuals and references materials.	0.46	0.42	0.76	NS
8.	Effective maintenance of modern equipment and tools by the auto technicians.	0.42	0.4	0.3	NS
9.	Usage of modern equipments and tools by auto-technicians.	0.35	0.47	-2.21	NS
10.	Workshop should be clean and have ventilation.	0.48	0.49	0.6	NS

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## **Keys**

$X_1$  = Mean of master craftsmen, SD1 = Standard Deviation of master craftsmen.

$X_2$  = Mean of apprentice, SD2 = Standard of apprentice

T = t-test calculated, NS = Not Significant, S = significant

Table 6, reveal that all the items were accepted indicating that there is no significant difference between the respondents hence null Hypothesis stated is accepted.

## **Findings**

The following are the major findings of this study. They are highlighted based on the research questions.

Both respondents agreed with the following concerning the current state of Advancement in automobile industry.

The modern vehicles are being operated and controlled by computerized electronic sensors, and also modern vehicles'

ignition system are electrically controlled unlike the old mechanical systems.

The respondents also agreed that there

are computers in the modern vehicles and also that the engine performance has increase in modern vehicles.

Both respondents agreed with the following concerning the development in automobile industry challenges of auto-technicians in Minna metropolis.

Specialized skills are needed by the auto technicians to work on these complex components in modern vehicles. And also, auto technicians must have inadequate knowledge of how complex vehicle components work and interact. Most auto technicians lack funds to procure modern diagnostic equipments and the increasing sophistication of automobile requires workers who can use computerized shop equipment and work with electronic components. Therefore, auto technicians will need to learn the science behind these automobiles and how to repair them.

Both respondents agreed with the following concerning the strategies of Advancement in automobile industry and Diagnosis and Repair of auto-technicians in Minna metropolis.

Educating auto-technicians through the organization of seminars and workshops and there should be availability of modern maintenance and other diagnostic equipment facilities in their workshop. Availability of technicians to work with electronics diagnostic equipment and digital manuals and references material.

### **Discussion of findings**

The discussions of findings are based on the research question posed for the study by the hypotheses.

The findings indicated the current state of Advancement in automobile industry and Diagnosis and Repair faced by auto technicians; the researcher find out that the modern vehicles are being operated and controlled by computerized electronic sensors and also modern vehicles' ignition systems are electrically controlled unlike the old mechanical systems. There are also computers in the modern vehicles and lots of complications in the modern automobile vehicles and also that the engine performance has increase in modern vehicles.

The finding indicated that the challenges affecting auto technicians. The researcher find out that the modern mechanical service require the use of more

complex and highly technological and special diagnostic equipment, and most of the auto technicians personnel's have poor educational background and by this, effective maintenance will not be carry out. Specialized skills are needed to work on those complex components in modern vehicles. Therefore, technicians must be able to work with electronic diagnostic equipment and digital manuals and reference materials so as a system which will make them perform optimally will be evolve.

The finding indicated that strategies to adopt in overcoming the challenges faced by auto technicians are identified that auto technician's personnel should be considered giving loans for them to purchase modern diagnostic tools and equipments for good and effective maintenance.

Auto technicians should be educated through the organization of seminars and workshops and that they should have modern maintenance and other diagnostic equipment facilities in their workshop.

Modern vehicle spare parts should be made available and accessible. Also, the auto technicians should have modern maintenance and auto technicians must be able to work with electronic diagnostic equipment and digital manuals and reference materials.



## **CHAPTER FIVE**

### **SUMMARY, CONCLUSIONS AND RECOMMENDATIONS**

#### **Summary of the study**

The automobile industry is undergoing dramatic changes to meet worldwide competition;

Automakers have adopted challenging technical and performance goals that stretch the limits of today's technology. The study considers the continuous absent of available and reliable vehicle in the country which arise from poor maintenance of vehicle facilities.

The purpose of this study was to investigate the Diagnosis and Repair faced by the auto technicians due to the Advancement in automobile industry so as to evolve a system which will make perform optimally.

The related literatures were reviewed in the study under the following sub- headings;

History of automobile industry, technological Advancement in automobile industry, the auto technicians and concept of maintenance. A research design was adopted for the study. The population for this study is apprentice and master craftsmen in Minna metropolis, Niger state. The instrument was analyzed using frequency count, mean and t – test three sections of research question were answered. The findings of the study are highlighted based on the research question.

## **Implications of the study**

The finding revealed that the modern vehicles are being operated and controlled by computerized electronic sensors and also modern vehicles' ignition systems are electrically controlled unlike the old mechanical systems.

Therefore, the auto technicians should be considered given loans by government/firms to enable them set standard workshops and purchased modern diagnostic equipments. This has a serious implication. If auto technicians are being provided with loans, the modern automobile diagnostic equipments and some materials need for maintenance will be purchase and be available in the workshops and a system which will make them perform optimally will be evolve.

The finding also revealed that specialized skills are needed by the apprentice to work on these complex components in modern vehicles. And also Auto technicians must have adequate knowledge of how vehicles' complex components work and interact. So there should be constant training and re-training of technician personnel's.

These have a serious implication if the technician personnel are well trained the performance of the cooperation will increase and all facilities will be in good condition and operate at maximum level. The findings revealed that there's need for effective maintenance of modern equipment and tools by auto technicians. If the facilities are well maintained they will extend their life span and last longer and also reduced the cost of purchasing new equipments. The finding also reveal that there should be adequate modern tools and equipment in the workshop, it will facilitates the maintenance activities when the need arise, workshop, thereby make the maintenance work reliable and effective.

## **Conclusion**

If a thing is worth doing at all it is worth doing well. The case for Advancement in automobile industry and Diagnosis and Repair face by auto-technicians in Minna metropolis has been to improve the automobile technology and enhancing the auto technicians so that they will operate at maximum level.

The greatest problem has been the increasing sophistication of automobiles which requires workers who can use computerized shop equipment and work with electronic components. Another trend is poor educational background of the technicians. Therefore, there is need for auto technicians to be educated through the organization of seminars and workshops.

There should be adequate training and re-training of auto technicians on modern technological development to meet up with the skills needed to work on these complex components in modern vehicles.

In automobile industries, new technology is needed to be learned to prepared the industries sector to be more reliable, dependable in the area of quality assurance management.

## **Recommendations**

Based on the findings of the study, it is recommended that

- Specialized skills are needed to work on these complex components in modern vehicles, there should be adequate training and re-training of auto technicians on modern technological Advancement.
- Technicians must have an increasing broad knowledge of how vehicles' complex component work and interact in a modern technology.
- The auto technicians should have modern maintenance and other diagnostic equipment facilities in their workshop so that they will operate at maximum level.

### **Suggestions for Further Study**

- Elevation of automobile industries in Minna metropolis, Niger state.
- Strategies on effective management of automobile industries in Minna metropolis Niger state.
- Assessment of occupational safety in –automobile industries in Niger state.

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