

# Comparative Studies on the Needs and Development of Autotronic Maintenance Training Modules for the Training of Automobile Independent Workshop Service Technicians in North – Western Region, Nigeria

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## ABSTRACT

Automobile Independent Workshop Service Technicians (popularly called roadside mechanics) are technical personals that repairs most of the automobile vehicles in Nigeria. Majority of these mechanics acquired their skills through apprenticeship training. Modern vehicle imported into the country posed greater challenges to the present automobile technicians particularly in the area of carrying out maintenance repairs of these latest automobile vehicles (autotronics vehicle) due to their inability to possessed autotronic skills competency. To source for solution to the above mentioned problems, therefore a research is carried out in North – Western region of Nigeria to produce a suitable maintenance training modules that can be used to train the technicians for them to upgrade/acquire the needed competencies for successful maintenance repair of the autotronic vehicles that were running everyday on the nation's roads. A cluster sampling technique is used to obtain a sample from the population. The population of the study is all autotronic inclined lecturers, instructors and independent workshop service technicians that are within North – Western region of Nigeria. There are seven states (Jigawa, Kaduna, Kano, Katsina, Kebbi, Sokoto and Zamfara) in the study area, these serves as clusters in the population. Five (5) states were randomly selected to serve as the sample size. The five states are Jigawa, Kano, Katsina, Kebbi and Zamfara, the

entire population of the five states which serves as clusters is (183), lecturers (44), instructors (49) and autotronic independent workshop service technicians (90), all of them were used in the study because of their manageable size. 183 copies of autotronic maintenance training module questionnaires (AMTMQ) with 174 and 149 question items respectively were administered and collected by the researcher with the help of an assistants, they are administered to 44 Polytechnic lecturers in the department of mechanical engineering, 49 instructors in skills acquisition centres/polytechnics and 90 master craftsmen of an independent workshops that are autotronic inclined. Data collected for answering research questions 1, 3, 4 and 5 were analysed using SPSS software version 22, Grand Mean and standard deviation were used to answer the research questions. Analysis of Variance (ANOVA) was used to test null hypotheses one (1) to three (3) and t-test statistical tool is used to analyzed hypotheses four (4) and five (5) all at 0.05 level of significance. The research conducted revealed that; all the objectives, contents/tasks, facilities, delivery systems and evaluation techniques contained in the questionnaire were required for the development of the autotronic maintenance training modules for independent workshop service technicians in the north – western zone of Nigeria. The skills upgrade training conducted by federal government in collaboration with SURE-P, NAC and SMEDEN

was not successful because the educational status of the target population was not considered in drafting the needed training modules. The mode of training used does not also take cognizance of the theoretical aspect of the trainees, especially basic science which rendered the programme ineffective and insufficient for the tasks on ground.

## I. INTRODUCTION

The automotive industry in Nigeria and the world over is generally being recognized as an engine of growth in any economy because of the important roles it plays in the execution of various activities. The roles of the industry consist of the manufacture of cars, commercial vehicles, motorcycles, bicycles and boats, airplanes, agricultural implements and their component parts. These are meant for transporting people and goods from one place to another, power generation, in agriculture and defense sector.

Nigeria in its efforts towards the realization of the above roles, established two passenger car assembly plants in 1972 which includes Volkswagen of Nigeria (VWN) and Peugeot Automobile of Nigeria (PAN) that have production capacities of 150 and 260 vehicles per day, respectively (Raw Materials Research and Development Council (RMRDC, 2000). These plants assembled cars from “Completely Knocked Down” (CKD) parts and had an initial capacity of not less than 100,000 cars annually (RMRDC, 2000). In 1975, four (4) more vehicle assembling plants were established. The plants include; Leyland Nigeria Limited, Anambra Motor Manufacturing Company Limited (ANAMMCO), Steyr Nigeria Limited and the National Trucks Manufacturers Limited (NTM), (RMRDC, 2000).

Innoson Vehicle Manufacturing Co. Ltd., shortened as **IVM**, is a Nigerian automobile and bus manufacturing company. It was founded in 2007 by Chief Innocent Chukwuma Nwala, and runs a plant in Nnewi in the state of Anambra. Innoson Vehicle Manufacturing is nicknamed Pride of African Road. 70% of the car parts are produced locally, while the rest is sourced from Japan, China, and Germany. Among IVM's vehicle models are the five-seaters Fox (1.5-litre engine) and Umu (2-litre engine) as well as the mini-bus Uzo (Wikipedia, 2021).

Automobile trades like any other discipline experience a very high level of technological advancement which led to a new area of specialization called Automotive Mechatronics. Mechatronics is a term originated by the Japanese to describe the integration of mechanical and

electronics engineering. The term Mechatronics was originated in 1969 by Senior Engineer; Tetsura Mori, who was working with Yaskawa electronic company. In 1970, Yaskawa applied to make this word a registered brand and got the right in 1973. Lamar (2010) explains Mechatronics as “the automation of machines by introducing computers and other electronics equipment to develop a system which provides new functions and capabilities with more accuracy at a lower cost”.

Jalal (2009), stressed that over two million Nigerian automobile independent workshop service technicians may be rendered unemployed, by the influx of new cars into the country. He explained that it is because the type of vehicles that they are trained to fix are getting extinct and in their place are wide range of fanciful/sophisticated vehicles imported into the country by individuals, firms and various governments, which they are not conversant with.

In a country, where majority of the practicing automobile independent workshop service technicians cannot interpret drawing and sketches, does not possess knowledge of electronics devices and computers, the high sophisticated combination of mechanical, electronic, computer and electrical parts put them at a disadvantage. Their knowledge of most new system in modern vehicles is generally low, while their inability to read and interpret electronics circuit diagrams is also a big problem (Jalal, 2009). He added that most of the independent workshop service technicians cannot repair many of the vehicles plying the Nigerian roads today, as a result of this they prefer to revert to an old system by changing the modern mean of operation to an old way, thereby making the vehicle operating systems to malfunction.

The automobile independent workshop service technicians of today, therefore, must be well and specially trained and equipped for an on-board diagnostic technology, if at all they want to remain in the profession (Malone, 2006). For the professional mechanics to effectively service and repair modern cars, he/she must have training and experience in a diverse range of subjects, which includes motor vehicle mechanics work, electrical and electronics craft practice, chemistry, physics and many more. New York State Automobile Dealers Association (NYSADA, 2006) posited that, automobile technicians must have an extensive knowledge in motor vehicle mechanic work, electrical and electronic plus computer craft practices, and the knowledge must be updated constantly to keep with rapid changes.

The independent workshop service technicians must understand not only the parts, nomenclature and operation, but also understand the diagnostic and service procedure for each system in the vehicle. The high technological nature of today's vehicles necessitates the need for regular mechanics training and re-training in Nigeria for them to be relevant in the modern vehicle maintenance. It is highlighted by Jalal (2009) that Nigerian independent workshop service technicians need to be re-trained to enable them cope with the high level of technological advancement particularly in the field of automobile, because their mode of apprenticeship training does not take care of this modern technology.

Abasa (2014) explained in his research that most of the problem encountered by many car owners is as a result of unskilled mechanics. More interesting is the fact that the vehicles come with contemporary technology, which many automobile technicians are not familiar with. Many automobile technicians pretend to know everything as relates to modern vehicle maintenance for them to retain their customers. Many cars are now fully automated, requiring that any mechanic who handles them must possess basic computer knowledge to diagnose faults and rectify them.

An independent workshop service technician who was interviewed by News Agency of Nigeria (NAN) said it was unfortunate that Nigerian automobile technicians were among the most laidback in automobile knowledge, skills and competencies. He said that although many vehicles were now fully automated, the average technician in Nigeria is yet to catch up with the technology of cars manufactured eight or ten years ago, not to talk of the more recent models and latest technology. He said, "There are vehicles that sometimes require automobile technician accessing the server of the manufacturer via the internet to re-programme the software. "Nigerian mechanics are going through the second leap of technical disconnection with global trends in automobiles." He urged government to encourage young graduates with interest in this field to acquire relevant skills because it would make them self-employed and reduce unemployment (Vanguard, 2015). The implication of this statement revealed that, the technicians had agreed that servicing modern vehicle without basic science would be very difficult, thereby advising government in using graduates with science biased into the profession so as to curtail what they experience in the vehicle maintenance services.

To develop any module /curriculum, need assessment must to be carried out to ascertain for the relevance and viability of the document to the target population. Maintenance is the process of preserving something or state of being maintained. Maintenance according to Olaitan in Ihediwah (2007) is a set of measure or steps taken to ensure that a given piece of equipment or infrastructure is kept in good operational order until it attains its maximum possible life span. Module according to Olaitan (2003) is a unit of curriculum based on the development of entry level competencies of trainees. Training is the activity of learning skills.

The drafted Autotronic Maintenance Training Modules (AMTM) will equip the independent workshop service technicians with skills in trouble shooting, diagnosing, repairing, servicing and replacement of faulty vehicle component if properly implemented and mastered by technicians. It will help in solving maintenance problems facing the car owners. It will also assist in reducing unemployment among youths. Autotronics maintenance training module will serve its purpose if the procedures for curriculum development and implementation are duly followed. Curriculum development according to Uzoka (2010) is a process where curriculum experts identify learning contents to be included and means of achieving them. These means are the learner objectives, selection of learning experiences and organization, personal resource materials, delivery system, contents and evaluation techniques (Olaitan, 2003). Curriculum development process consists of producing the curriculum materials including the course objectives, contents, learning experience, resources or facilities, and evaluation techniques. Research design suitable for this study is research and development (R & D) design. The R&D design is used when developing new educational products such as AMTM. This study is designed to develop autotronics maintenance training modules for independent workshop service technicians of north – western zone of Nigeria.

The study is carried out in north – western region of Nigeria; the main purpose of the study is to develop training modules that can be used to train independent workshop service technicians for maintenance repairs of modern vehicle (autotronic vehicle). Specifically the study is sought to achieve the following:

1. Determine the objectives of autotronic maintenance training modules
2. Determine the contents of autotronic maintenance training modules
3. Identify facilities required for maintenance of

autotronic vehicle

Determine the delivery systems that could be employed for implementing autotronic maintenance training modules

4. Determine the evaluation techniques for autotronic maintenance training module
5. Develop autotronic maintenance training modules

## II. METHODOLOGY

A questionnaire developed by the researcher, named it Autotronic Vehicle Maintenance Training Module Questionnaires (AVMTMQ). The instrument was given to three experts in the field of technology education in the Faculty of Technology Education Abubakar Tafawa Balewa University Bauchi, for them to look at the face and content validations of the instrument.

The instrument was given to three experts for face, content and construct validation, one Professor, one Senior Lecturer in the field of technology education, they were specifically asked to look at the content of the instruments based on the educational level and skills needed by the target population (automobile independent workshop service technicians). The Senior Lecturer in the field of measurement and evaluation in the faculty of technology education, Abubakar Tafawa Balewa University, Bauchi, the expert is required to assess the instruments on its validity of measuring the research questions formulated and hypotheses. A document was given together with the instrument to serve as a guide in the validation process. Observations raised by the experts include splitting the questionnaire into two; one to be administered to lecturers and instructors, the second one is to be given only to independent workshop service technicians as it does not contain method of delivery system and evaluation techniques. All the observations, insertions, deletions and corrections were effected on the Autotronic Vehicle Maintenance Training Module Questionnaires (AVMTMQ) before proceeding for the study.

In the data collection of the study, two sets of questionnaires were used; the first one was administered to lecturers and instructors, which contained 174 items. The second one was administered to only the independent workshop service technicians, which contained 149 items. The questionnaire was administered to 44 lecturers drawn from mechanical engineering departments of the polytechnics that are within north – western zone of Nigeria. It is also given to 49 Instructors of Skills Acquisition Centres and 90 automobile

Independent workshop service technicians that are within the study areas. A total of 183 questionnaires were administered and retrieved by the researcher with the help of research assistant. The data obtained from the respondents is computed and analyzed using Statistical Package for Social Sciences (SPSS) version 22 software.

### 2.1 Area of the Study

The study is conducted in North – Western Region of Nigeria.

### 2.2 Population for the Study

The population for the study are all the lecturers (in autotronic) of Mechanical Engineering Department of Polytechnics, Instructors in the Motor Vehicle Trade from Skills Acquisition Centres/polytechnics and practicing autotronic vehicle independent workshop service technicians that are within the area of the study will serve as the population.

### 2.3 Sample and Sampling Technique

A cluster sampling technique is used to obtain a sample from the population. A cluster sampling technique is adopted because of unavailability of tentative lists of target population, identification of the population is very difficult and also the issue of location is another point of consideration, result to these the researcher opt for this sampling procedure. The population of the study is all autotronic inclined lecturers, instructors and independent workshop service technicians that are within North – Western region of Nigeria. There are seven states (Jigawa, Kaduna, Kano, Katsina, Kebbi, Sokoto and Zamfara) in the study area, these serve as clusters in the population. Five (5) states were randomly selected to serve as the sample size. The five states are Jigawa, Kano, Katsina, Kebbi and Zamfara, the entire population of the five states which serves as clusters is (183), lecturers (44), instructors (49) and autotronic independent workshop service technicians (90), all of them were used in the study because of their manageable size.

### 2.4 Instrument of for Data Collection

A structured questionnaire titled: Autotronic Maintenance Training Module Questionnaire (AMTMQ) are used as instrument for data collection and is on 5-point Likert scale. Autotronic maintenance training module questionnaire was developed based on the specific purposes of the study. To develop the AMTMQ, the researcher formulated the objectives of autotronic maintenance training modules and

visited Polytechnics, Skills Acquisition Centres and independent workshop service garages within the five (5) states (Jigawa, Kano, Katsina, Kebbi and Zamfara) to identify various tasks and added information from literature to it in order to make the contents of the autotronic maintenance training modules. The researcher also listed types of facilities for maintenance of all kinds of autotronic vehicles and reviewed literature on possible delivery systems, evaluation techniques and activities for assessing training modules.

Autotronic maintenance training module questionnaire with five point Likert response scales of 5, 4, 3, 2 and 1 representing Very Strongly Required, Strongly Required, Moderately, Not Required and Strongly Not Required was developed to collect data from the respondents (Lecturers, Instructors and independent workshop service technicians). AMTMQ was divided into Part 1 and 2. Part 1 solicited information on personal data of the respondents while part 2 with five sections A, B, C, D and E solicited information on the: objectives of autotronic maintenance training modules, contents of autotronic maintenance training modules, facilities required for maintenance of autotronic vehicles, delivery strategies (instructional methods) that could be employed for implementing autotronic maintenance training modules, the evaluation techniques and activities that could be used for assessing autotronic maintenance training modules respectively. The respondents were asked to rank the response options to an item based on the level at which each item or task is required for the development of autotronic maintenance training modules for independent workshop service technicians.

### **2.5 Validation of the Instrument**

Autotronic Maintenance Training Module Questionnaire (AMTMQ) was subjected to face validation by three experts/validates. Face validation is a means of justifying the appropriateness of items in an instrument to be used for a study (Uzoagulu, 1998). The instrument was given to three experts for face, content and construct validation, one Professor, one Senior Lecturer in the field of technology education, they were specifically asked to look at the content of the instruments based on the educational level and skills needed by the target population (automobile independent workshop service technicians). The Senior Lecturer in the field of measurement and evaluation in the faculty of technology education,

Abubakar Tafawa Balewa University, Bauchi, the expert is required to assess the instruments on its validity of measuring the research questions formulated and hypotheses. A document was given together with the instrument to serve as a guide in the validation process. Observations raised by the experts include splitting the questionnaire into two; one to be administered to lecturers and instructors, the second one is to be given only to independent workshop service technicians as it does not contain method of delivery system and evaluation techniques. All the observations, insertions, deletions and corrections were effected on the Autotronic Vehicle Maintenance Training Module Questionnaires (AVMTMQ) before proceeding for the study.

The questionnaire was subjected to content validation through try out to determine the appropriateness and structure of the skill items identified through the respondents. The title, the purpose of the study, the statement of the problem, research questions and hypotheses were attached to the instrument to guide the validates. They were requested to reword the items as they consider appropriate, correct any mistakes such as ambiguous or unclear statement, wrongly conceived ideas, missing information, irrelevant items, ascertain the adequacy of the items in the questionnaire for equipping independent workshop service technicians with skills for maintenance of autotronic vehicles and other observed errors. Items in the AMTMQ were sequentially organized by the validates. They were also requested to review the items in terms of their clarity, relevance, appropriateness of language and instructions to the respondents. The validates were requested to include relevant items into the questionnaire. Their corrections and comments were used to modify the questionnaire. The final version of the instrument was structured based on their corrections.

### **2.6 Reliability of the Instrument**

Cronbach alpha reliability method was used in determining the internal consistency of questionnaire items. The choice of Cronbach alpha reliability method is based on the fact that, the questionnaire is multiple response type (Deji, 2014). The AMTMQ is administered to a sample size of 183 respondents comprising, 44 lecturers, 49 instructors and 90 automobile independent workshop service technicians in North – western region of Nigeria. Their responses were analyzed using Statistical Package for the Social Science (SPSS) 22 version.

Table 1. Reliability Index of the Variable Construct

S/N	Variable Construct (Cluster)	No of Item	Reliability ( r )	Remarks
1	Objectives	11	0.818	VSR
2	Content	88	0.950	VSR
3	Facilities	50	0.950	VSR
4	Delivery	16	0.895	VSR
5	Evaluation	9	0.803	VSR

Table 1 above showed the reliability index of each variable construct, the reliability coefficient of all the construct are above the minimum value of reliability that an item can be accepted as reliable for inclusion of any research work.

### 2.7 Method of Data Collection

Copies of the AMTMQ were administered and retrieved from the respondents within the study area (North – western zone of Nigeria) by the researcher and research assistants. They were trained on how to interpret the questionnaire items to the respondents most especially to automobile independent workshop service technicians. The research assistants were also briefed on how to approach the respondents and administer the questionnaire on them.

### 2.8 Method of Data Analysis

Data collected for answering research questions 1, 3, 4 and 5 were analysed using SPSS software version 22, Mean and standard deviation were used to answer research questions. Analysis of Variance (ANOVA) was used to test null hypotheses one (1) to three (3) and t-test statistical tool is used to analyzed hypotheses four (4) and five (5) all at 0.05 level of significance

## III. PRESENTATION OF RESULTS

The data collected for the study were analyzed to provide answers to the research questions and test the null hypotheses. The findings were also presented based on the research questions and hypotheses tested. Discussions of the findings are also incorporated into the presentation.

### Research Questions One

What are the objectives of autotronic maintenance training modules?

The data obtained reveals that 11 objectives of autotronic vehicle maintenance training modules were required. The Grand Means for the objectives ranged from 4.0 to 4.6. Each

Grand Mean is above the cutoff of 3.50 indicating that all could be the objectives of autotronic vehicle maintenance training modules for automobile independent workshop service technicians. The standard deviation values for the nine specific objectives ranged from 0.5 to 1.4 and were less than 1.96 that is 95% confidence limit. This showed that the respondents were not far from one another in their responses and that their responses were not far from the mean. This added some value to the reliability of the mean.

### Research Questions Two

What are the contents of autotronic maintenance training modules?

The outcomes of the study presented 88 relevant contents of autotronic vehicle maintenance training modules that are required by independent workshop service technicians in North –Western region for them to function effectively in the maintenance of latest autotronic vehicles. The Grand Means for the relevant content ranged from 4.0 to 4.4. Each Grand Mean is above the cutoff of 3.50 indicating that all could be the relevant content of autotronic vehicle maintenance training modules for automobile independent workshop service technicians. The standard deviation values for the 88 contents/tasks ranged from 0.5 to 1.4 and were less than 1.96 that is 95% confidence limit. This showed that the respondents were not far from one another in their responses and that their responses were not far from the mean. This added some value to the reliability of the mean.

### Research Questions Three

What are the facilities required for maintenance of autotronic?

The data obtained from the study showed that 50 relevant facilities were needed to carry out maintenance repair of autotronic vehicles. The Grand Means for the relevant facilities ranged from 4.0 to 4.4. Each Grand Mean is above the cutoff of 3.50 indicating that all could be the relevant facilities of autotronic vehicle maintenance training modules for automobile independent workshop

service technicians. The standard deviation values for the fifty relevant facilities ranged from 0.6 to 1.4 and were less than 1.96 that is 95% confidence limit. This showed that the respondents were not far from one another in their responses and that their responses were not far from the mean. This added some value to the reliability of the mean.

#### Research Questions Four

What are the delivery systems that could be employed for implementing autotronic maintenance training modules?

The data obtained from the study presents 16 relevant Delivery Systems that can be employed in the training of independent workshop service technicians using the training module in the study area. The Grand Means for the Delivery System ranged from 4.2 to 4.4. Each Grand Mean is above the cutoff of 3.50 indicating that all could be the Delivery System of autotronic vehicle maintenance training modules for automobile independent workshop service technicians. The standard deviation values for the twelve Delivery Systems ranged from 0.5 to 1.0 and were less than 1.96 that is 95% confidence limit. This showed that the respondents were not far from one another in their responses and that their responses were not far from the mean. This added some value to the reliability of the mean.

#### Research Questions Five

What are the evaluation techniques that could be used for assessing autotronic maintenance training modules?

The data presented from the study reveals that 9 Evaluation Techniques of autotronic vehicle maintenance training modules are required. The Grand Means for the Evaluation Techniques ranged from 4.0 to 4.4. Each Grand Mean is above the cutoff of 3.50 indicating that all could be the Evaluation Techniques of autotronic vehicle maintenance training modules for automobile independent workshop service technicians. The standard deviation values for the nine Evaluation Techniques ranged from 0.7 to 0.9 and were less than 1.96 that is 95% confidence limit. This showed that the respondents were not far from one another in their responses and that their responses were not far from the mean. This added some value to the reliability of the mean.

#### Hypotheses

**H0<sub>1</sub>:** There is no significant difference in the mean responses of lecturers, instructors and Automobile Independent Workshop Service Technicians (AIWOST) on the objectives of Autotronic Maintenance Training (AMT) modules

**Table 2: Analysis of Variance (ANOVA) of the Descriptive Mean Responses of Lecturers, Instructors and AIWOST on AMTM Objective**

	N	Mean	Std. Dev.	Std. Error	95% Confidence Interval for Mean			
					Lower Bound	Upper Bound	Min.	Max.
Lecturers	44	4.1652	.50881	.07671	4.0105	4.3199	2.91	5.00
Instructors	49	4.2847	.55959	.07994	4.1240	4.4454	3.09	5.00
AIWOST	90	4.3830	.42653	.04496	4.2937	4.4723	3.36	5.00
Total	183	4.3043	.49047	.03626	4.2328	4.3759	2.91	5.00

**Table 3: Analysis of Variance (ANOVA) of the ANOVA (AMTM Objective)**

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	1.427	2	.714	3.033	.051
Within Groups	42.354	180	.235		
Total	43.781	182			

**Table 4: AMTM Objective Post Hoc Tests (Multiple Comparisons)**

(I) group	(J) group	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Lecturers	Instructors	-.11947	.10075	.712	-.3629	.1240
	AIWOST	-.21777*	.08923	.047	-.4334	-.0021
Instructors	Lecturers	.11947	.10075	.712	-.1240	.3629
	AIWOST	-.09831	.08612	.766	-.3064	.1098

AIWOST	Lecturers	.21777*	.08923	.047	.0021	.4334
	Instructors	.09831	.08612	.766	-.1098	.3064

The mean difference is significant at the 0.05 level.

A one way analysis of variance was conducted to determine the significant difference in the mean response of lecturers, instructors and AIWOST on the required objectives, for the AMT module. Table 2 (descriptive mean response) indicated that AIWOST has the highest mean of 4.38, followed by instructors and finally lecturers, considering their standard deviation which fall within the same range indicated that, the variation of all the responses of all the respondents across all items is not much.

Table 3 (ANOVA AMTM objective) indicated that there is statistically significant difference between the three groups [  $f(2, 180) = 3.033, p = .051$ ]. thus the null hypotheses which stated that There is no significant difference in the mean responses of lecturers, instructors and Automobile Independent Workshop Service

Technicians (AIWOST) on the objectives of Autotronic Maintenance Training (AMT) modules is now rejected, while Table 4 (the post hoc test/ multiple comparison) indicated that the mean response of lecturers (  $M=4.16, SD =.508$ ) was significantly different from the AIWOST group (  $M =4.38, SD=.426$ ), but did not differ from the instructors response. The implication on this hypothesis is that: there is significant difference in the responses between lecturers and AIWOST, which means when the module is to be implemented, there is need to find out were the differences are and rectify them.

**H0<sub>2</sub>:** There is no significant difference in the mean responses of lecturers, instructors and automobile independent workshop service technicians on the contents of autotronic maintenance training modules

**Table 5: Analysis of Variance (ANOVA) of the Descriptive Mean Responses of Lecturers Instructors and AIWOST on AMTM Content**

	N	Mean	Std. Dev.	Std. Error	95% Confidence Interval for Mean			
					Lower Bound	Upper Bound	Min.	Max.
Lecturers	44	4.1648	.49552	.07470	4.0141	4.3154	3.15	5.00
Instructors	49	4.1778	.59253	.08465	4.0076	4.3479	2.93	5.00
AIWOST	90	4.2826	.40732	.04294	4.1972	4.3679	3.34	5.00
Total	183	4.2262	.48462	.03582	4.1555	4.2969	2.93	5.00

**Table 6: Analysis of Variance (ANOVA) of the ANOVA (AMTM Content)**

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	.567	2	.283	1.210	.301
Within Groups	42.176	180	.234		
Total	42.743	182			

A one way analysis of variance was conducted to determine the significant difference in the mean response of lecturers, instructors and AIWOST on the required content, for the AMT module. Table 5 (descriptive mean response) indicated that AIWOST has the highest mean of 4.28, followed by lecturers and finally instructors, considering their standard deviation which fall within the same range indicated that, the variation of all the responses of all the respondents across all items is not much.

Table 6 (ANOVA AMTM content) indicated that there is no statistically significant difference between the three groups [  $f(2, 180) =$

$1.210, p = .301$ ]. Thus the null hypotheses which stated that there is no significant difference in the mean responses of lecturers, instructors and Automobile Independent Workshop Service Technicians (AIWOST) on the content of Autotronic Maintenance Training (AMT) modules is now accepted, thus while post hoc test/ multiple comparison is not required.

**H0<sub>3</sub>:** There is no significant difference in the mean responses of lecturers, instructors and automobile independent workshop service technicians on the facilities required for maintenance of autotronic vehicle.



**Table 7: Analysis of Variance (ANOVA) of the Descriptive Mean Responses of Lecturers Instructors and AIWOST on AMTM Facilities**

	N	Mean	Std. Dev.	Std. Error	95% Confidence Interval for Mean		Min.	Max.
					Lower Bound	Upper Bound		
Lecturers	44	4.1732	.54624	.08235	4.0071	4.3393	3.10	5.00
Instructors	49	4.2237	.44708	.06387	4.0953	4.3521	3.20	5.00
AIWOST	90	4.3360	.44708	.04713	4.2424	4.4296	3.18	5.00
Total	183	4.2668	.47534	.03514	4.1974	4.3361	3.10	5.00

**Table 8: Analysis of Variance (ANOVA) of the ANOVA (AMTM Facilities)**

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.908	2	.454	2.032	.134
Within Groups	40.214	180	.223		
Total	41.122	182			

A one way analysis of variance was conducted to determine the significant difference in the mean response of lecturers, instructors and AIWOST on the required facilities, for the AMT module. Table 7 (descriptive mean response) indicated that AIWOST has the highest mean of 4.33, followed by instructors and finally lecturers, considering their standard deviation which fall within the same range indicated that, the variation of all the responses of all the respondents across all items is not much.

Table 8 (ANOVA AMTM facilities) indicated that there is no statistically significant difference between the three groups [ $F(2, 180) =$

$2.03, p = .134$ ]. Thus the null hypotheses which stated that There is no significant difference in the mean responses of lecturers, instructors and Automobile Independent Workshop Service Technicians (AIWOST) on the facilities of Autotronic Maintenance Training (AMT) modules is now accepted, thus post hoc test/ multiple comparison is not required.

**H0<sub>4</sub>:** There is no significant difference in the mean responses of lecturers and instructors on the delivery systems that could be employed for implementing autotronic maintenance training modules.

**Table 9: Independent sample t test Descriptive Mean Responses of Lecturers and Instructors on AMTM Delivery System**

Group	N	Mean	Std. Deviation	Std. Error Mean
Lecturers	44	4.3905	.42140	.06353
Instructors	49	4.2855	.52814	.07545

**Table 10: Independent Samples Test on Delivery**

	Levene's Test for Equality of Variances		t-test for Equality of Means		Sig. (2-tailed)	Std. Mean Diff.	Std. Error Diff	95% Confidence Interval of the Difference	
	F	Sig.	t	Df				Lower	Upper
Equal variances assumed	2.04	.156	1.051	91	.296	.10494	.09983	.09336	.30324
Equal variances not assumed			1.064	89.8	.290	.10494	.09863	.09101	.30090

An independent sample t test was conducted to compare the mean responses of lecturers and instructors on the delivery system of AMTM, table 9 (descriptive mean responses) of lecturers and instructors and table 10 (independent sample t test on delivery system) indicated that there was no significant difference in the mean score for lecturers (M = 4.39, SD = .421) and instructors [M = 4.28, SD = .528; t (91) = 1.051. p = .296]. thus the hypothesis which stated that There is no significant difference in the mean responses

of lecturers and instructors on the delivery systems that could be employed for implementing autotronic maintenance training modules is accepted

**H0<sub>5</sub>:** There is no significant difference in the mean responses of lecturers and instructors on the evaluation techniques and activities that could be used for assessing each of the Autotronic Maintenance Training modules.

**Table 11: Independent sample t test Descriptive Mean Responses of Lecturers and Instructors on AMTM Evaluation**

	Group	N	Mean	Std. Deviation	Std. Error Mean
Evaluation	Lecturers	44	4.1011	.51037	.07694
	Instructors	49	4.2702	.47949	.06850

**Table 12: Independent Samples Test on Evaluation**

Levene's Test for Equality of Variances		t-test for Equality of Means				95% Confidence Interval of the Difference			
F	Sig.	t	Df	Sig. (2-tailed)	(2-Mean Diff.)	Std. Diff.	Lower	Upper	
Equal variances assumed	.324	.571	-1.647	91	.103	-.16907	.10267	-.37300	.03487
Equal variances not assumed			-1.641	88.4	.104	-.16907	.10302	-.37378	.03564

An independent sample t test was conducted to compare the mean responses of lecturers and instructors on the evaluation technique of AMTM, table 11 (descriptive mean responses of lecturers and instructors and table 12 (independent sample t test on evaluation system) indicated that there was no significant difference in the mean score for lecturers (M = 4.10, SD = .510) and instructors [M = 4.27, SD = .479; t (91) = -1.647. p = .103]. thus the hypothesis which stated that There is no significant difference in the mean responses of lecturers and instructors on the evaluation technique that could be employed for implementing autotronic maintenance training modules is accepted

specific objectives of Autotronic maintenance training modules were needed in the training of independent workshop service technicians. All the items on this cluster are within the Grand Means range of between 4 .0 to 4 .6 which is above the cut off mark of 3.50. Based on this all the 9 items were required for inclusion in the draft of the training module. Objectives of a programme serve as guide for the implementation of training modules. It directs trainers and trainees on what to learn, the types of skills, knowledge to acquire, which assist in capacity building programme.

The findings of this study revealed 88 contents/tasks of Autotronic maintenance training modules are required in the drafted training module. All the items on this cluster are within the Grand Means range of between 4 .0 to 4 .4 which is above the cut off mark of 3.50. Based on this all the 88 items were required for inclusion in the AMTM. Content is relevant when it meets the need of a society such as unemployment; by teaching what

#### IV. DISCUSSION OF THE FINDINGS

The major findings of the study are discussed as follows:

The findings of this study revealed that 11

is relevant or related to societal issues at hand through practical and theoretical concepts, therefore the study revealed the contents/tasks that are needed for the independent workshop service technicians to be equipped for the maintenance of modern vehicles moving on Nigerian roads, thereby contribute their part in nation building.

The findings of the study indicated 50 facilities that are needed for Autotronic maintenance training modules implementation. The items are within the Grand Means range of between 4.0 to 4.4 which is above the cut off mark of 3.50. All the 50 identified facilities are required for successful training of the technicians in autotronic vehicles maintenance. The study outlined the facilities that are needed by every autotronic garage for it to carry out good maintenance repair work effectively, this will assist the government in providing required equipments to independent workshop service technicians at subsidize price.

Sixteen (16) delivery methods/techniques are useful in the impacting of skills competencies in autotronic for the mechanics. The items are within the Grand Means range of between 4.2 to 4.4 which is above the cut off mark of 3.50. Based on this all the 16 items were required for teaching autotronic vehicles skills competencies to the independent workshop service technicians. Knowing the delivery methods that best suit the impacting of knowledge by the trainers is of great benefits to both trainers and trainees.

The findings of this study revealed 9 evaluation methods that are best for evaluating the skills acquired in autotronic vehicles maintenance repair by the roadside mechanics. All the items on this cluster are within the Grand Means range of between 4.0 to 4.4 which is above the cut off mark of 3.50. Based on this the 9 items were required for autotronic vehicles skills competencies evaluation processes. After every training there are needs to evaluate the program to ascertain its success, this is of paramount importance particularly to the trainer, of which it will assist him/her in assessing the success or failure of the lesson or programme that were delivered.

Table 3 (ANOVA AMTM objective) indicated that there is statistically significant difference between the three groups [ $f(2, 180) = 3.033, p = .051$ ]. thus the null hypotheses which stated that There is no significant difference in the mean responses of lecturers, instructors and Automobile Independent Workshop Service Technicians (AIWOST) on the objectives of Autotronic Maintenance Training (AMT) modules is now rejected, by implication it means further

analysis has to done to find out the reasons and were exactly the difference is and modify the objectives before the implementation stage of the module, while Table 4 (the post hoc test/ multiple comparison) indicated that the mean response of lecturers ( $M=4.16, SD =.508$ ) was significantly different from the AIWOST group ( $M =4.38, SD=.426$ ), but did not differ from the instructors response.

Table 6 (ANOVA AMTM content) indicated that there is no statistically significant difference between the three groups [ $f(2, 180) = 1.210, p =.301$ ]. Thus the null hypotheses which stated that There is no significant difference in the mean responses of lecturers, instructors and Automobile Independent Workshop Service Technicians (AIWOST) on the contents of Autotronic Maintenance Training (AMT) modules is now accepted, thus while post hoc test/ multiple comparison is not required.

Table 8 (ANOVA AMT facilities) indicated that there is no statistically significant difference between the three groups [ $f(2, 180) = 2.03, p =.134$ ]. Thus the null hypotheses which stated that There is no significant difference in the mean responses of lecturers, instructors and Automobile Independent Workshop Service Technicians (AIWOST) on the facilities of Autotronic Maintenance Training (AMT) modules is now accepted, thus post hoc test/ multiple comparison is not required.

An independent sample t test was conducted to compare the mean responses of lecturers and instructors on the delivery system of AMTM, table 9 (descriptive mean responses of lecturers and instructors and table 10 (independent sample t test on delivery system) indicated that there was no significant difference in the mean score for lecturers ( $M = 4.39, SD = .421$ ) and instructors [ $M = 4.28, SD =.528; t(91) = 1.051, p =.296$ ]. thus the hypothesis which stated that There is no significant difference in the mean responses of lecturers and instructors on the delivery systems that could be employed for implementing autotronic maintenance training modules is accepted

An independent sample t test was conducted to compare the mean responses of lecturers and instructors on the evaluation technique of AMTM, table 11 (descriptive mean responses of lecturers and instructors and table 12 (independent sample t test on evaluation system) indicated that there was no significant difference in the mean score for lecturers ( $M = 4.10, SD = .510$ ) and instructors [ $M = 4.27, SD =.479; t(91) = -1.647, p =.103$ ]. thus the hypothesis which stated

that There is no significant difference in the mean responses of lecturers and instructors on the evaluation technique that could be employed for implementing autotronic maintenance training modules is accepted

## V. CONCLUSION

The need of high skill manpower in the repair maintenance of autotronic vehicles that moves on Nigerian roads, necessitate the demand of retraining of the present independent workshop service technicians in the area of automobile. Vehicles imported into the country are now very complex; they were equipped with advance technology which the mechanics are not conversant with. Sequel to the above mentioned reasons a research is conducted to determine the skills that are lacking by the technicians and used it to develop a training module for training of the mechanics for the purpose of bridging the gap between what is needed and what is acquired in the maintenance of modern vehicles. From the finding of the study the independent workshop service technicians lacks skills to carry out effective maintenance of the autotronic vehicles, based on this skills/tasks required by the technicians were identified and included in the drafted module. In drafting this module educational status, pre-requisite knowledge and other valuable information of technicians were considered.

## VI. RECOMMENDATIONS

Based on the findings of the study the following recommendations are proposed to help independent workshop service technicians acquire the needed skills in the maintenance of modern vehicles and assist in contributing towards economic development of the country:

1. Government should take cognizance of educational level of the mechanics in mounting any programme as to make it successful for the economic development of the country
2. A subsidy provided by government will help in providing employment
3. Government should encourage graduates of tertiary institutions to go into mechanic business of modern vehicle as to rapidly bridge the existed gap in the trade.
4. Review of motor vehicle mechanic work curriculum at basic education levels (vocational and technical schools) should be conducted to include autotronic area of the profession.

## VII. DELIMITATION OF THE STUDY

This study only covered North – Western region of Nigeria and primarily focused on development of autotronic vehicle maintenance training modules for independent workshop service technicians. The developed autotronic maintenance training modules were developed but not trial tested. The study covered objectives of autotronic maintenance training modules, contents of autotronic maintenance training modules which covered Engine Fuel, Cooling and Lubrication Systems. Also focused in the study are delivery systems, facilities for the maintenance of autotronic and evaluation techniques and activities for assessing each of the autotronic maintenance training modules. The draft of autotronic maintenance training modules was produced, reproduced and packaged for independent workshop service technicians.

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