

## BRIDGING THE GAP: PRACTICAL SKILLS REQUIRED OF MOTOR VEHICLE TECHNOLOGY GRADUATES FOR EMPLOYMENT IN ONDO STATE, NIGERIA

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**Abstract:** The unemployment of motor vehicle technology graduates in Nigeria is chiefly accredited to skills divergence between what is taught in technical colleges and what is demanded by the automobile industry. This study assessed the practical skills required of motor vehicle technology graduates for employment in Ondo State. Three research questions steered the study. A descriptive survey design was adopted. The population comprised 85 motor vehicle technology instructors and 142 automobile industry employers in Ondo State. The entire population of 227 was used for the study. Data were collected using a 21-item questionnaire (PSRMVTG) with reliability coefficient of 0.70 using Cronbach Alpha. Mean and standard deviation were used to answer research questions. Findings revealed that engine mechanics skills are highly required and possessed by graduates of motor vehicle technology. Major skills required by employers include: trouble shooting with On Board Diagnostics, Version 2 (OBD-II) scanner, servicing of mechatronics systems and customer service/digital record keeping the result indicated a relative skill gap in modern diagnostic equipment which industries demanded currently. It was recommended that, Government and NBTE should equip technical colleges and workshops in Ondo State with modern OBD-II scanners, hybrid vehicle trainers and mechatronics kits. Retraining of instructors should be organized on ECU diagnostics, hybrid/electric vehicles and robotics to bridge the identified skill gaps.

**Keywords:** Practical Skills, Motor Vehicle Technology, Employment, Technical Colleges, Ondo State, Gap, Graduates.

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### Introduction

One of the main trade programmes offered by Government Technical Colleges is motor vehicle technology, which trains students to maintain and repair automobiles and produces highly qualified artisans for the automotive sector. Producing graduates who are independent and employable is the plan of technical education (NBTE, 2022). For many years, the chief focus of this training was on engine mechanics, carburetors and using simple hand tools like spanners to do repairs (NADDC, 2023).

However, presently, automobiles operate differently, utilizing digital technology; this is known as Industry 4.0 (Kozma, 2022). The combination of cyber-physical systems, the internet of things, artificial intelligence and digital diagnostics in automobiles is what defines Industry 4.0. For operation and defect detection, modern vehicles rely on Electronic Control Unit (ECUs), sensors and computer-based systems. Employers today require artisans with the ability to service mechatronic systems operate scan tools and interpret trouble codes (Kozma, 2022).

Employers in Owo, Ondo, Akoko axis and Akure are requesting various things now because of the aforementioned. They are looking for artisans that can read fault codes, connect a scanner to an automobile and resolve electrical issues, not merely an engine dismantler (Ogundele, 2023; Osanipin, 2024). The issue at hand is that a large number of Ondo State technical college

graduates still possess outdated competences. The majority of institutions still lack current diagnostic equipment in their workshops. Theory and analog practice still make up the majority of the instruction. As a result, these graduates find it difficult to complete tasks using the analog approach when they go to the garage for employment.

Despite this, many Ondo State technical college graduates in the field of motor vehicle technology are still unemployed or underemployed. Employers expressed dissatisfaction over graduates' lack of practical knowledge and inability to identify new car problems using modern methods. This creates a divide between industry demands and training (Ogundele, 2023). Based on this issue, this study aims to identify the particular practical potentials graduates in motor vehicle technology need in order to find employment in Ondo State.

### Statement of the Problem

Because there is growing concern that motor vehicle technology graduates from Ondo State lack the practical skills needed to work in the digital automotive sector. Analog devices are still used at technical college workshops, despite the industry's shift to digital diagnostics. If this gap is not filled, graduates will continue to be unemployed. Given this, the purpose of this study is to assess the practical skills required for employment.

## Purpose of the Study

The main purpose of this study is to evaluate the practical skills required of motor vehicle technology graduates for employment in Ondo State. Specifically, the study intended to:

- Identify practical skills possessed by graduates;
- Determine practical skills required by automobile industry employers;
- Determine the gap between skills possessed and skills required;

## Research Questions

The following research questions directed the study:

- What practical skills in engine mechanics do motor vehicle technology graduates of technical colleges in Ondo State possessed?
- What practical skills in electrical/electronic and diagnostics do motor vehicle technology graduates of technical colleges in Ondo State possessed?
- What practical skills in mechatronics and Information and Communication Technology (ICT) do motor vehicle technology graduates of technical colleges in Ondo State possessed?

## Significance of the Study

The results of this study will benefit students, researchers, technical college administration, NBTE and the Ondo State Ministry of Education. The results will assist National Board for Technical Education (NBTE) in updating the MVT curriculum to better suit the demands of the modern automotive industry and society at large. The results will assist Tertiary Education Trust Fund (TETFUND) and the Ondo State Ministry of Education in determining what equipment technical colleges should purchase. They will be able to properly plan for Ondo State Technical, Vocational Education and Training (TVET).

The result will be used by technical college administrators to determine what kind of training instructors should receive and what equipment should be used in the workshop. The graduates or students will have the necessary skills if the guidelines were followed. This will make it easier for them to find employment and possibly start their own workshop. This study will help the researchers by providing reference information for future studies in TVET and motor vehicle technologies.

## Scope of the Study

The study covered four technical colleges in Ondo State offering motor vehicle technology and registered automobile workshops/garages in Akure, Ondo town, Owo and Ikare.

## Literature Review

### Practical Skills

The concept of practical skills refers to the hands-on, applied competencies that enable an individual to perform specific tasks in a real workshop setting without further training. In the context of motor vehicle technology, practical skills encompasses diagnostic, mechanical, auto-electrical/electronic and digital competencies required to service modern vehicles. These include the use of OBD-II, scanners and engine analyzers to read fault codes and interpret live data, operation of modern digital measuring instruments such as multimeters and oscilloscopes and the ability to use computer applications and digital service

manuals. Other critical practical skills are auto-electricity and electronics servicing, maintenance of hybrid vehicle engines and battery systems, interpretation of technical charts and services manuals and proficiency in emerging areas such as CNG and Electric Vehicle conversion and maintenance. However, evidence suggests that a wide gap exists. (2024) observed that the majority of graduates of the motor vehicle mechanic programme are neither employable nor entrepreneurially viable owing to lack of practical knowledge and skill in managing cutting edge automotive technologies and this has resulted in a skill gap that limits graduates employability and effectiveness.

### Motor Vehicle Technology

It is a specialized area within technical and vocational education and training (TVET) that deals with the principles, design, construction, operation, maintenance and repair of automobiles and related systems. The scope of MVT in Nigerian technical colleges traditionally covered engine systems, power train, chassis, auto body and basic auto-electrical work. However, with the rapid advancement in automotive technology, the role of auto-electricity and electronics within the MTV programme has grown significantly. Contemporary automobiles now integrate complex electronic control units, sensors and computerized systems that require new diagnostic tools and fault detection methods. Ogundele (2023) reported a significant competency gap among automobile technology graduates in Southwest Nigeria, particularly in the use of digital diagnostic tools and computerized vehicle systems. Furthermore, Thomas et al (2023) found that automobile engineering graduates require improvement in 49 skill areas to effectively maintain hybrid vehicles in Nigeria including the use of modern/digital measuring instruments and the interpretation of engine analyzer tests. The Nigerian Automotive Design and Development Council (2023) also acknowledged in the revised NAIDP 2023 that previous policies failed to deliver on skills development and subsequently initiated competency-based training in 2024 focusing on CNG conversion, EV maintenance and modern diagnostics.

### Employment

The concept employment in this context refers to the engagement of MVT graduates in productive work, either in formal establishment such as vehicle dealerships, and Compressed Natural gas/Electric Vehicle (CNG/EV) workshops or through informal establishment (self-employment) as auto-entrepreneurs. Employment opportunities for MVT graduates in Ondo State are increasingly tied to their ability to handle modern, computerized vehicles. Yet, there is a national challenge of skills deficit. According to Punch (2024), across the country, finding competent auto technicians has become increasingly difficult and in the automotive sector, many mechanics lack the expertise to handle modern computerized vehicles. Rather than to diagnose faults accurately, they resort to trial-and-error repairs. This situation is compounded by the fact that Nigeria ranked 105th out of 109 countries in the 2024 Global Skills Proficiency rankings, with particular weakness in technology and data science. The implication for Ondo State is that graduates who lack digital and diagnostic competencies are excluded from lucrative opportunities in modern workshops while employers are forced to seek skilled artisans from neighbouring countries or rely on expatriates.

### Theoretical Framework

This study was guided by two theories: Human Capital Theory propounded by Becker Gary. S. in 1964 and Skill Gap

Theory propounded by Cappelli, Peter in 2015. The incorporation of the two theories provides a concrete root for understanding the problem of unemployment among motor vehicle technology graduates in Ondo State.

Becker posits that investment in education, training and skill development boosts the knowledge, productivity and receiving capacity of individuals. Becker viewed people as a type of capital, arguing that just as investment in physical assets yields economic profits, investment in people through practical and technical training also capitulate returns in the form of higher productivity, employability and national enlargement. In the circumstance of MVT, the practical and digital skills acquired by graduates such as OBD-II diagnostics, hybrid/EV maintenance and CNG conversion comprise their human capital. Therefore, when technical colleges in Ondo State provide contemporary equipment, restructured curriculum and experienced instructors, they are building the human capital of MVT graduates. The current face up of graduate joblessness and under unemployment suggests under-investment in MVT human capital which has inferences for both livelihoods and the economy of Ondo State.

Cappelli on the other hand argued that there is mismatch between the skills possessed by job seekers/graduates and the skills required by employers in the labour market. He stated that the skills gap is not just about graduates lacking skills but also about the employers' hope, technology changes and training institutions failing to keep up. This theory is relevant because it accounts for the open gap between the MVT curriculum in Nigerian technical colleges and the skill requirements of current automotive workshops in Ondo State. Therefore, bridging the gap requires a purposeful restructuring of the MVT curriculum, retraining of instructors, provision of new diagnostic equipment and stronger affiliation between technical colleges and the automobile industries in Ondo State.

In a nutshell, both Becker and Cappelli explained the cause and the solution to the problem in Ondo State. Becker explained that the lack of investment in practical skill expansion has undermined the human capital of MVT graduates, making them less prolific and less eye-catching to employers. Cappelli, explained that there even where some training exists, there is a mismatch between what is taught and what modern workshops, dealerships and CNG/EV centers in Ondo State actually needed. Therefore, bridging the gap requires two actions: First, put-in in

MVT human capital by renewing curriculum, providing digital investigative tools and retraining instructors as suggested by Becker. Second, support MVT training with industry needs through partnership with automotive industries and NADDC intervention programmes to slam the skills mismatch as suggested by Cappelli and Becker. When these are done, MVT graduates will become employable and add meaningfully to the transport and technical sector of Ondo State

## Methodology

The descriptive survey design was chosen for the study because the researcher wanted to get feedback on the skills required from both employers and instructors. The population consisted of 227 respondents, which included 142 automobile workshop owners in Ondo State and 85 motor vehicle technology instructors. Since the population was not too large a process known as total enumeration no sample was used; 219 (96.5%) of the respondents completed the questionnaire. The Practical Skills Required of Motor Vehicle Technology Graduates (PSRMVTG) questionnaire was scrutinized by three lecturers in the Department of Vocational and Technical Education at Ekiti State University, Ado-Ekiti. It was divided into four sections: A and B. Section B contained 21 items measured on a 4-point Likert scale: Very Highly Required (VHR) =4, Highly Required (HR) =3, Low Required (LH) =2 and Very Low Required (VLR) = 1. The instrument was pilot tested on the respondents that were not part of the study at Ekiti State and was analyzed using Cronbach Alpha formular which yielded a reliability coefficient of 0.70. The instrument was analyzed using SPSS following the collection of the questionnaires to determine the mean and standard deviation of the data. The analysis for research questions 1-3 was done using the mean and standard deviation. The decision point was set at a criterion mean of 2.50. Items having a mean of 2.50 or higher were possessed, while those with a mean of less than 2.50 were deemed not possessed.

## Results

The data collected were analyzed based on the research questions.

- **Research Question One:** What practical skills in engine mechanics do motor vehicle technology graduates of technical colleges in Ondo State possessed?

**Table 1: Mean Ratings on Engine Mechanics Skills Required**

| S/N | Engine Mechanics Skills                                                   | Mean        | SD          | Decision        |
|-----|---------------------------------------------------------------------------|-------------|-------------|-----------------|
| 1   | Dismantle and assemble petrol and diesel engines.                         | 3.62        | 0.48        | Required        |
| 2   | Carryout cylinder head re-facing, valve grinding and seating.             | 3.51        | 0.60        | Required        |
| 3   | Check and adjust valve clearance and tappet setting.                      | 3.53        | 0.52        | Required        |
| 4   | Diagnose causes of engine knocking, overheating and low compression ratio | 3.30        | 0.82        | Required        |
| 5   | Overhaul and replace piston, piston rings and bearings.                   | 3.53        | 0.67        | Required        |
| 6   | Perform fuel injection pump timing and injector servicing.                | 3.56        | 0.63        | Required        |
| 7   | Carryout engine tune-up including carburetor and ignition system.         | 2.92        | 0.85        | Required        |
|     | <b>Cluster Mean</b>                                                       | <b>3.41</b> | <b>0.65</b> | <b>Required</b> |

Table 1 show that all 7 items on engine mechanics skills had means ranging from 2.92 to 3.62, which are above the cut-off of 2.50. The cluster mean of 3.41 indicates that engine mechanics skills are highly required and possessed by graduates of motor vehicle technology in Ondo State Technical colleges.

- **Research Question Two:** What practical skills in electrical/electronic and diagnostics do motor vehicle technology graduates of technical colleges in Ondo State possessed?

**Table 2: Mean Ratings on Electrical/Electronic and Diagnostic Skills Required**

| S/N | Electrical/Electronic and Diagnostic Skills                       | Mean        | SD          | Decision        |
|-----|-------------------------------------------------------------------|-------------|-------------|-----------------|
| 8   | Test, service and replace battery, alternator and starter         | 3.59        | 0.49        | Required        |
| 9   | Carryout vehicle wiring, fault tracing and repair.                | 3.56        | 0.55        | Required        |
| 10  | Use digital multimeter to test continuity, voltage and resistance | 3.57        | 0.54        | Required        |
| 11  | Diagnose and repair lighting, horn, wiper and ignition systems    | 3.46        | 0.72        | Required        |
| 12  | Use OBD-II scanner to read and clear diagnostic trouble codes     | 2.90        | 0.87        | Required        |
| 13  | Diagnose ECU, sensors actuators and CAN-BUS systems               | 2.90        | 0.90        | Required        |
| 14  | Interpret wiring diagrams and service manuals using computer.     | 3.47        | 0.72        | Required        |
|     | <b>Cluster Mean</b>                                               | <b>3.35</b> | <b>0.68</b> | <b>Required</b> |

Table 2 show that all 7 items were required with cluster mean of 3.35. However, items 12 and 13 on On Board Diagnostics, Version 2 (OBD-II) scanner and Engine Control Unit (ECU) diagnostics recorded the lowest means of 2.90. This indicates a relative skill gap in modern diagnostic equipment which industries demanded currently.

**Research Question Three:** What practical skills in mechatronics and Information and Communication Technology (ICT) do motor vehicle technology graduates of technical colleges in Ondo State possessed?

**Table 3: Mean Ratings on Mechatronics and ICT Skills Required**

| S/N | Engine Mechanics Skills                                            | Mean        | SD          | Decision        |
|-----|--------------------------------------------------------------------|-------------|-------------|-----------------|
| 15  | Use internet to download vehicle technical manuals and diagrams    | 3.25        | 0.80        | Required        |
| 16  | Use computer for spare parts documentation and invoicing           | 3.30        | 0.76        | Required        |
| 17  | Operate automotive simulation and training software                | 2.66        | 0.85        | Required        |
| 18  | Diagnose hybrid and electric vehicle systems.                      | 2.29        | 1.12        | Not Required    |
| 19  | Interface and programme vehicle sensors and control modules.       | 2.20        | 1.15        | Not Required    |
| 20  | Use AutoCAD/CAD software for automotive component design           | 2.49        | 0.88        | Not Required    |
| 21  | Apply basic robotics and mechatronics principles in vehicle repair | 2.19        | 1.16        | Not Required    |
|     | <b>Cluster Mean</b>                                                | <b>2.63</b> | <b>0.96</b> | <b>Required</b> |

Table 3 shows a cluster mean of 2.63. Items 15-17 on basic ICT had means above 2.50. However, items 18-21 on hybrid vehicles, programming, AutoCAD and robotics had means below 2.50. This shows a major deficiency in 21st century mechatronics skills.

### Discussion of Findings

The findings of this study revealed that engine mechanics skills are highly required and possessed by motor vehicle technology graduates in Ondo State with a cluster mean of 3.41.

This agrees with Ogunyemi and Adebayo (2021) who reported that traditional engine overhaul skills remain the foundation of automobile practice in Nigeria. The high possession of these skills may be attributed to the long period of emphasis on conventional engine systems in technical colleges.

On electrical/electronic and diagnostic skills, the study found that while basic electrical skills were well possessed, modern diagnostic skills using OBD-II and ECU recorded low means of 2.90. This finding agrees with the study of Idoko (2020) who stated that most technical college graduates in Nigeria cannot effectively

use diagnostic scanners. The implication is that graduates may struggle with modern vehicles that depend largely on electronic control system.

Furthermore, the study revealed that a major gap in mechatronics and ICT skills with cluster mean of 2.63. Specifically, skills in hybrid vehicle diagnosis, programming of control modules and robotics were possessed. This supports the submission of UNESCO-UNEVOC (2019) that technical education in Africa is lagging behind in mechatronics integration. The inability of graduates to handle hybrid and electric vehicles poses a threat to their employability as the Nigerian automotive industry moves toward cleaner technologies

## Conclusion

Based on the findings, it was concluded that motor vehicle technology graduates in Ondo State have strong competence in conventional engine and basic electrical skills. However, they lack requisite skills in modern diagnostics, hybrid technology and mechatronics. Therefore, there is an urgent need to retool technical colleges to meet 21st century industry demands.

## Recommendations

Based on the findings, the following recommendations are made:

1. Government and NBTE should equip technical colleges and workshops in Ondo State with modern OBD-II scanners, hybrid vehicle trainers and mechatronics kits.
2. Retraining of instructors should be organized on ECU diagnostics, hybrid/electric vehicles and robotics to bridge the identified skill gaps.
3. NBTE should review the NTC and NVC curriculum to integrate ICT, simulation software and mechatronics as core modules.
4. Technical colleges should partner with automobile companies for SIWES and hands-on training on modern vehicles.

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