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Navigating Nigeria's Digital Vehicle Shift: Uncovering Training Needs for a New Generation of Automobile Technicians.

Lemo, O.O.

Department of Industrial Technical Education, Tai Solarin University of Education, Ijagun, Ijebu-Ode, Ogun State.
Corresponding Author: Rossandlemo@yahoo.co.uk

Abstract

The era of digital vehicle revolution is rapidly spreading globally and Nigeria is not left out. This reality has necessitated the need to upgrade the skills of auto-technicians. Unfortunately, many automobile technicians in Nigeria are neither literate nor prepared for the swiftly evolving auto technology landscapes. This study aimed to uncover the training needs of Nigeria's automobile technicians, identify the specific technical skills they required, and appropriate training programmes designed to address the skills gap among automobile technicians in Nigeria. The paper explores secondary sources of data to build a robust argument in favour of the existing gap in the skills and competence of Nigerian automobile technicians. Findings from existing literature revealed that Nigerian auto-technicians will need to go through training and re-training sessions. In conclusion, this study highlights a deeper deficit in training needs and outlines a training guide to mitigate such a gap. The study therefore recommended that auto technicians should collaborate with IT and computer experts to enhance their effectiveness. It was also recommended that the government provide well-equipped auto digital laboratories with trained trainers in each senatorial district in the country to provide competency training for auto technicians training. Also, the Government should reduce taxes on imported digital maintenance technologies, tools and equipment, this will reduce costs and encourage mass adoption. Furthermore, low-interest loans should be provided to the technicians to purchase modern maintenance tools and equipment lastly Auto industries should also partner with auto technicians' associations to provide them with insight into the latest technologies used in the industries.

Keywords: Digital vehicle, Training needs, New-generation, Automobile technician

INTRODUCTION

In recent times, the global technological knowledge explosion has led to the growth and development of Nigeria's automotive industry in various dimensions. Since the invention of the first automobile, the needs of consumers have necessitated improvements in the design and construction of modern vehicles to offer more efficiency, comfort, convenience, durability, speed, affordability, as well as safety to the consumers. These are achieved through the continuous incorporation of digital technologies into almost all the systems of vehicles. Henry (2023) refers to Digital technologies as hardware devices such as personal computers, and tablets; tools, such as calculators; systems such as software applications, the internet, Robotics apparatuses, Artificial intelligence (AI), and the Internet of things (IoT). Due to the globalization of the technology market, these digitalized modern vehicles are finding their way into Nigeria. However, Jude (2023) noted that many automobile technicians in Nigeria are neither literate nor prepared for the rapidly evolving auto technology landscapes. Furthermore, Onyedinefu (2022) noted that about 50% percentage of Nigerians do not understand the concept of digital literacy. Mohammed (2023) also opined that about 50% of Nigerian auto technicians are illiterates when it comes to digital technologies and systems for which as a result, a large number of broken-down vehicles using digital systems, tend to be abandoned or

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shipped for repairs abroad for those that can afford doing such. That is why Manfred (2001) advised that our auto technicians must be made to undergo significant literacy training on the use and maintenance of automotive digital systems and technologies. Moreover, Rajeswararao (2014) posits that it is important to uncover the content of training programs that would raise the competency level of auto technicians.

The rapid shift to digitalized vehicles and the incompetence of our auto-technicians to cope with the maintenance needs of digitalized automobiles or vehicles are calling for the quick upgrade of our auto-technicians in the area of electric vehicle technology, electronic cluster systems and technologies, electric power storage systems and advanced diagnostic techniques and the use of digital repair methods. Also, the acquisition of appropriate skills and competence in the use of digital tools and software required for vehicle repair and maintenance has now become an absolute necessity. According to Orie (2023), any training that will be of significant effect must be properly approached and designed to include certain necessary knowledge, skills and attitudes needed to stay effective in the maintenance of digitalized vehicles, this study aims to unravel the training needs of an automobile technician in Nigeria who desires to cope with the technical requirements for the maintenance and repair of the modern vehicles. By identifying the gap in skills created by the shift, the study then seeks to look into some effective training methods that will be of immense benefit to the technicians and improve their effectiveness.

STATEMENT OF THE PROBLEM

Automobile Technicians are trained to be able to handle various levels of repair and maintenance work on automobiles. However, due to the limitation of being trained with 19th-century manual automobiles or vehicles, coupled with low educational level and lack of skill to use modern technologies used for troubleshooting and repairing the 21st century-digitalized automobiles, Nigeria automobile technicians have been left at a great disadvantage and the resultant effect is their inability, to meet the competency level required to effectively meet the maintenance and servicing needs of the modern automobile industry.

Therefore, essence of this study is to unravel the skills deficits and training needs required to enable Nigerian automobile technician meet the needs and challenges of the 21st century digitalise automobiles.

The Purpose of this Research

The purpose of this study is to uncover the training needs of Nigeria's automobile technicians as the nation navigates through the era of modern digital vehicle shift. However, the specific purpose of the write-up is to:

i. Identify the specific technical skills required for technicians to work with digital vehicles (e.g., programming, software updates, and electrical systems).
ii. Identify the training needs of automobile technicians in Nigeria to effectively work with digital vehicles.
iii. Identify the appropriate training programs designed to address the skills gap and prepare technicians for the digital vehicle shift.

RESEARCH QUESTION

1. What are the specific technical skills required for technicians to work with digital vehicles (e.g., programming, software updates, and electrical systems)?
2. What are the training needs of automobile technicians in Nigeria to effectively work with digital vehicles?
3. How can training programs be designed to address the skills gap and prepare technicians for the digital vehicle shift?

RELATED WORKS

The Auto Technicians' Training Needs

The world is witnessing a time of continuous improvement in the power, efficiency and security of vehicles due to the continuous incorporation of digital technologies into the various systems of vehicles. (Fichman et al., 2014). To this Yoo (2010) noted that vehicles all over the world have become digitized systems and they are offering enormous benefits for automobile entrepreneurs, consumers, and society in general. Johnstone (2024) refers to digital technology as tools, systems and devices that can generate, process, store or transmit data. The data processing and logic capabilities of digital technologies found in vehicles are enabled through microprocessors that are

programmed to perform various functions. According to Stephen (2024), these digital technologies enable vehicles to be able to gather data on the conditions surrounding them and the various systems they are made up of. The data from the various devices are then processed and the output produces helpful information to the vehicle users.

As such, Newman (2017) noted that such Data/information can be processed or analyzed to direct the attention of a user to the vehicle's call for predictive maintenance, adjustment in driving mode, advice on the best route to follow based on traffic and weather conditions etcetera. It can also help the vehicle in making successful autonomous driving (Self-driving), and self-parking, and enhances the safety and convenience of driving. Advance Driver Assistance System (ADAS) for example, can automatically apply brakes or slow down the vehicle based on proximity to other vehicles or road users. Furthermore, Haleem (2022) noted that by analyzing data from various sensors and diagnostic tools, these digitalized tools can accurately predict potential faults, schedule maintenance tasks, and recommend suitable replacement parts, thereby minimizing unexpected breakdowns and repair costs. Orie (2023) believes that as good as digitalization may be, it is posing great challenges to auto technicians as they have to continuously get reskilled. Also, Newman (2017) opined that there is a scarcity of certified technicians who are capable of effectively handling the maintenance and repair of digitized vehicles in Nigeria. According to Naser (2024), a good number of our auto-technicians are illiterate when it comes to computer systems. Pat (2024) believes that as the automotive industry shifts toward smart and connected vehicles, tradespeople who service vehicles will need stronger digital competencies. Similarly, Haleem (2022) opined that to thrive in this dynamic landscape, auto technicians must possess a diverse set of technical skills such as:

(i) Data Analytics and Artificial Intelligence (AI)
(ii) Cyber security
(iii) Electric and Hybrid Vehicle Technology
(iv) Software Development and Embedded Systems
(v) Autonomous Vehicle Technology.

Technical Skills Training Guide

Naser (2024) thinks that personnel who wish to be skilled in the maintenance of digital systems of an automobile must undergo training so, he gave some practical training guides as follows:

a) project participation
b) Training methods and materials.
    i. Classroom training.
    ii. Videotaping.
    iii. Pre-installation hands-on training.
    iv. Computer-based training.
c) Generic platform training courses.
    i. Overview training.
    ii. Application development training.
    iii. Troubleshooting training.
    iv. Database management training.
    v. Display building training.
    vi. Report generation training.
    vii. Application specific training.
d) Training Schedule.
e) Lesson plan.
f) Training manual and equipment.

Theoretical concepts

Many theories are connected with the shift of vehicles (Brynjolfsson 2014). They include:

I. **The Technology Acceptance Model (TAM)** explains the acceptance of information systems by individuals. TAM postulates that the acceptance of technology is predicted by the users' behavioural intention, which is, in turn, determined by the perception of technology's usefulness in performing the task and the perceived ease of its use. Marikyan and Papagiannidis (2024)

II. **Diffusion of Innovation (DOI)**, developed by E.M. Rogers in 1962. It originated in communication to explain how, over time, an idea or product gains momentum and diffuses (or spreads) through a specific population or social system. The result of this diffusion is that people, as part of a social system, adopt a new idea, behaviour, or product. Adoption means that a person does something differently than what they had previously (i.e., purchase or use a new product, acquire and perform a new behaviour, etc.). The key to adoption is

that the person must perceive the idea, behaviour, or product as new or innovative. It is through this that diffusion is possible. Wayne (2022).

Conceptual framework

The following are concepts that are relevant to understanding the paper:

I. **Digitalization:** Digitalization refers to the practice of taking processes, content or objects that are used to be primarily (or entirely) physical or analogue and transforming them to be primarily (or entirely) digital. The new era of digitalization has already started and shows the first step of a new business world with a change in the division of work.

II. **An automotive technician** is a professional who fixes, inspects and helps maintain vehicles. He diagnoses vehicles for problems by test-driving them and interacting with the vehicle using diagnostic tools on vehicle electronics. He interprets various vehicle diagnostic codes to understand the causes of a vehicle breakdown and conduct repair work. (Bright 2020)

III. **Training needs** refer to the identified skills needed by a professional to perform effectively in a task. The training needs of an auto technician in the maintenance of digitalized vehicles can be uncovered by carrying out necessary tests (Cody 2023)

IV. **Competency** refers to any observable and/or measurable knowledge, skill, ability or behaviour that contributes to successful job performance. (IRCC Behavioral and Technical Competency Dictionary)

V. **Digital literacy** refers to the ability to access, manage, understand, integrate, communicate, evaluate and create information safely and appropriately through digital technologies for employment, decent jobs and entrepreneurship. It includes competencies that are variously referred to as computer literacy, ICT literacy, information literacy and media literacy. (UNESCO 2018)'

Training needs

The digital shift in the technology of vehicles as well as the various researches carried out on the competence of our auto-technicians on the systems of these vehicles have revealed their skill gap and training needs in troubleshooting and repairs. (Cody 2023). On this Naser (2024) gave the following as the area of training that is relevant and necessary to the maintenance and repair of digital systems:

a) **Digital Literacy**: (i) Basic computer skills (ii) Online navigation and research (iii) Digital tool usage (e.g., diagnostic software)
b) **Electric Vehicle (EV) Technology**: (i) EV fundamentals (e.g., battery management, charging systems) (iii) EV maintenance and repair (iv) EV safety procedures
c) **Autonomous Vehicle (AV) Technology**: (i) AV fundamentals (e.g., sensor systems, AI algorithms) (ii) AV maintenance and repair (iii) AV safety procedures
d) **Connected Car Technology**: (i) Connected car fundamentals (e.g., telematics, IoT) (ii)Connected car maintenance and repair (iii) Connected car cyber security
e) **Advanced Driver-Assistance Systems (ADAS):** (i) ADAS fundamentals (e.g., sensors, cameras) (ii)ADAS maintenance and repair (iii) ADAS calibration and testing
f) **Data Analysis and Interpretation**: (i) Data collection and analysis tools (ii) Data-driven decision making (iii) Troubleshooting using data analysis
g) **Cyber security**: (i) Vehicle cyber security fundamentals (ii) Threats and vulnerabilities (iii) Cyber security best practices
h) **Artificial Intelligence (AI) and Machine Learning (ML**) (i) AI and ML fundamentals (ii) AI and ML applications in the automotive industry (iii)AI and ML troubleshooting.

Nick (2024) noted that technicians are to go through, short time, one-year and multi-year training programs to learn vehicle digital technologies properly. Owo (2019) noted that the government has a significant role to play in the building of able manpower for the nation and therefore recommends that the government

should participate in organizing training for our auto-technicians

CONCLUSION

As Nigeria joins the rest of the world in shifting to the use of digitalized vehicles, there is a need for a new generation of auto technicians and. the nation should also work towards preparing its automobile technicians so that they would fit in and be capable of facing the challenges of repair and maintaining these vehicles. As the digital landscape of automobile technology continues to evolve rapidly, the importance of prioritizing the training needs of automobile technicians cannot be over-emphasized. In this regard, this study highlighted significant gaps in the current skills possessed by Nigeria's Auto technicians. A deeper deficit in training needs was identified. However, various technical skills required by the technicians were also identified and a training guide was outlined and discussed.

RECOMMENDATIONS

The current global technological trajectory seems to be fully accelerated on a linear ascending projection and only technicians who have upskilled their competence would survive in the dawn of a digitally dependent society. Though skills gaps have been identified, the need for training and mode of training discussed, there are however recommendations that need to be made.

1. One of the characteristics of the digital age is partnership and collaboration. An auto technician should build a bridge of collaboration with I.T. and computer experts. This partnership and collaboration can lead to skill transfer, better problem-solving ability and effectiveness.
2. The government at both federal and state levels need to be intentional in raising the competence level of Nigerian auto technicians by providing well-equipped automobile digital training laboratories with competent trainers and instructors at each senatorial district to provide training for technicians at a subsidized const.
3. The government should reduce taxes on digital maintenance technologies, tools and equipment required by auto technicians. This step would help reduce costs and encourage mass adoption.
4. Low-interest loans should be made available through auto technicians' associations for those who desire to upskill their competence and also upgrade their equipment, tools and other troubleshooting apparatuses.
5. Auto industries should also partner with auto technicians' associations to provide them with insight into the latest technologies used in the industries and capacity building which is necessary for understanding the interconnection and interdependence of automotive digital systems.

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