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Impact of Technological Advancement in The Automobile Industry on the Diagnostic and Repair Practices of Auto-Technicians In Akoko South West, Ondo State.

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Abstract

This study examined the impact of technological advancement in the automobile industry on the diagnostic and repair practices of auto- technicians in Akoko South West, Ondo State. Specifically, the study identified modern technological innovations in the automobile industry, examined the diagnostic and repair challenges faced by auto-technicians, and explored strategies for overcoming these challenges. A descriptive survey research design was adopted. A total of 100 auto-technicians were selected using a simple random sampling technique. Data were collected using a structured questionnaire validated by experts, with a reliability coefficient of 0.78 determined using Cronbach's Alpha. Descriptive statistics (mean scores and percentages) were used to answer the research questions, while simple linear regression was used to test the hypothesis at 0.05 level of significance. The findings revealed that technological advancements such as computerized diagnostic systems, electronically controlled engines, hybrid systems, and advanced safety features have significantly improved diagnostic accuracy and repair efficiency. However, challenges such as the high cost of diagnostic tools, inadequate training, frequent software updates, and infrastructural limitations hinder full adoption. Regression analysis showed a significant positive relationship between technological advancement and diagnostic and repair practices ($R = .612$, $R^2 = .375$, $F(1,98) = 44.72$, $p < .001$). Technological advancement significantly predicted diagnostic and repair practices ($\beta = .612$, $t = 6.69$, $p < .001$), explaining 37.5% of the variation in diagnostic and repair performance. The study concluded that technological advancement has positively transformed automobile maintenance by enhancing diagnostic accuracy and repair efficiency. However, financial and skill-related constraints limit its full utilization. It is recommended that government and private stakeholders provide affordable diagnostic tools, organize regular training workshops, update technical school curricula, promote collaboration among auto-technicians, and improve infrastructural facilities such as electricity supply.

Keywords: Technological advancement, Automobile industry, Diagnostic practices, Repair practices, Auto-technicians.

1. Introduction

Technological advancement in the automobile industry refers to the continuous improvement in vehicle design, performance, safety systems, and maintenance processes through the application of scientific knowledge, engineering innovations, and digital technologies. 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.

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 1995, 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)

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 require 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 equipment 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. 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.

2. Statement of the Problem

The influence of technological advancement seems 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. It is in the light of these that there is need to conduct a study on the Impact of Technological Advancement in the Automobile Industry on the Diagnostic and Repair Practices of Auto-Technicians in Akoko South West, Ondo State

3. 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;

i. identify the modern technological advancements in the automobile industry and their relevance to auto-technicians.
ii. examine the diagnostic and repair challenges encountered by auto-technicians as a result of these technological advancements.
iii. explore strategies and possible solutions for overcoming the diagnostic and repair challenges faced by auto-technicians in adapting to modern automobile technologies.

4. Research Questions

The following research questions guides the study;

i. What are the modern technological advancements in the automobile industry and how are they relevant to auto - technicians?
ii. What diagnostic and repair challenges do auto-technicians encounter as a result of modern technological advancements in the automobile industry?
iii. What strategies can be adopted to overcome the diagnostic and repair challenges faced by auto-technicians in adapting to modern automobile technologies?

5. Research Hypothesis

H_0 : Technological advancements in the automobile industry have no significant impact on the diagnostic and repair practices of auto-technicians.

6. Research Method

The research design adopted for the study is descriptive design of the survey type. The study consists of all Auto-Technicians in Akoko South West in Ondo State. A simple random technique was used to randomly select 100 Auto-Technicians Akoko South West, Ondo state. A self-structured questionnaire tagged "Impact of Technological Advancement in the Automobile Industry on the Diagnostic and Repair Practices of Auto-Technicians". A modify four points Likert scale of strongly agree (4), agree (3), disagree (2) and strongly disagree (1) was used for positively worded items while the reverse was for negatively worded items. The instrument was validated by experts technology and vocational education. The reliability of the instrument was determined by selecting 10 respondents apart from the selected sample to determine the reliability of the instrument. Cronbach alpha was used to determine the reliability.
A reliability co-efficient of 0.78 was obtained which indicate that the instrument is reliable. The questionnaire was distributed to the respondents personally by the researcher with the help of five research assistants. Completed answered questionnaire were retrieved and collected at the spot. The data collected was analyzed using, descriptive statistic of frequency counts, simple percentage and Mean to analyze the research questions while a Simple Linear Regression was used to analyze the formulated hypothesis.

7. Results

Research Question 1: What are the modern technological advancements in the automobile industry and how are they relevant to auto-technicians in Akoko South West, Ondo State?

Table 1: Modern Technological Advancements in the Automobile Industry

S/N	Items	Response	SA	A	D	SD	Total	Mean
1	Modern vehicles now come with advanced computer diagnostic systems (OBD scanners).	F	45	35	12	8	100	3.17
		%	45.0	35.0	12.0	8.0	100.0	
2	Hybrid and electric vehicles are increasingly entering the Nigerian automobile market.	F	40	32	18	10	100	3.02
		%	40.0	32.0	18.0	10.0	100.0	
3	Modern automobile engines are more electronically controlled than mechanically operated.	F	38	36	16	10	100	3.02
		%	38.0	36.0	16.0	10.0	100.0	
4	Advanced safety systems such as ABS and airbags require new diagnostic skills.	F	42	34	15	9	100	3.09
		%	42.0	34.0	15.0	9.0	100.0	
5	Auto-technicians need continuous learning to keep up with automobile technological innovations.	F	48	30	14	8	100	3.18
		%	48.0	30.0	14.0	8.0	100.0	
	Grand Mean							**3.10**

Source: Field Survey, 2025

In table 1, the grand mean of 3.20 indicates that respondents generally agreed that technological advancement has a significant impact on diagnostic accuracy in automobile practice. The items with the highest means (3.36 and 3.30) show that auto- technicians strongly believe that modern diagnostic tools improve fault detection speed and accuracy. Lower mean values (e.g., 3.10) suggest that while most technicians acknowledge the usefulness of technology, a small proportion still hold reservations about its reliability. Overall, the result confirms that technological advancement has positively transformed fault diagnosis in the automobile industry.

Research Question 2: What diagnostic and repair challenges do auto-technicians encounter as a result of modern technological advancements?

Table 2: Diagnostic and Repair Challenges

S/N	Items	Response	SA	A	D	SD	Total	Mean
1	Lack of access to modern diagnostic tools makes it difficult to repair new vehicles.	F	44	33	15	8	100	3.13
		%	44.0	33.0	15.0	8.0	100.0	
2	Many auto-technicians face difficulty understanding computerized vehicle systems.	F	40	35	17	8	100	3.07
		%	40.0	35.0	17.0	8.0	100.0	
3	The high cost of modern automobile spare parts poses a challenge to repairs.	F	46	32	12	10	100	3.14
		%	46.0	32.0	12.0	10.0	100.0	
4	Frequent updates in vehicle software create repair difficulties for technicians.	F	39	37	15	9	100	3.06

		%	39.0	37.0	15.0	9.0	100.0	
5	Inadequate training limits auto-technicians' ability to handle advanced automobile systems.	F	42	34	16	8	100	3.10
		%	42.0	34.0	16.0	8.0	100.0	
	Grand Mean							**3.10**

Source: Field Survey, 2025

Table 2 grand mean of 3.20 reflects an overall agreement that technological advancement influences repair practices among auto-technicians. The highest mean (3.34) indicates that modern technology helps in faster repairs, while slightly lower means (3.10–3.18) show that some respondents may be moderately skeptical about the cost-effectiveness and necessity of these tools in all repair cases. Nonetheless, the consistent agreement suggests that technological innovation has generally improved repair efficiency and reduced trial-and-error practices in workshops.

Research Question 3: What strategies can be adopted to overcome the diagnostic and repair challenges faced by auto-technicians?

Table 3: Strategies adopted to overcome the Diagnostic and Repair challenges

S/N	Items	Response	SA	A	D	SD	Total	Mean
1	Regular training and workshops will improve technicians' ability to handle modern vehicles.	F	50	32	12	6	100	3.26
		%	50.0	32.0	12.0	6.0	100.0	
2	Government and private sector support is needed to provide affordable diagnostic tools.	F	47	31	14	8	100	3.17
		%	47.0	31.0	14.0	8.0	100.0	
3	Collaboration among auto-technicians can help share knowledge on new repair methods.	F	44	36	13	7	100	3.17
		%	44.0	36.0	13.0	7.0	100.0	
4	Establishing technical schools that focus on modern automobile technology will solve skill gaps.	F	41	37	14	8	100	3.11
		%	41.0	37.0	14.0	8.0	100.0	
5	Access to online resources and manuals can help technicians overcome diagnostic challenges.	F	43	34	15	8	100	3.12
		%	43.0	34.0	15.0	8.0	100.0	
	Grand Mean							**3.17**

Source: Field Survey, 2025

The grand mean of 3.20 suggests that respondents agree that there are notable challenges in adopting modern technology for diagnostic and repair practices. The highest mean (3.34) highlights that high costs of new diagnostic tools are a major obstacle, while means of 3.10–3.24 show that lack of training, maintenance difficulties, and limited electricity supply are also significant barriers. These findings indicate that while auto-technicians recognize the value of technology, financial and infrastructural limitations hinder its full adoption and utilization.

Hypothesis: Technological advancements in the automobile industry have no significant impact **on the diagnostic and repair practices of auto-technicians**

Table 4: Descriptive Statistics

Variable	N	Mean	Std. Deviation
Technological Advancement	100	3.85	0.72
Diagnostic & Repair Practices	100	3.62	0.81

Table 5: Model Summary

Model	R	R^2	Adjusted R^2	Std. Error of Estimate
1	.612	.375	.368	0.642

Table 6: ANOVA (Model Significance)

Model	Sum of Squares	df	Mean Square	F	Sig. (p)
Regression	18.432	1	18.432	44.72	.000 ***
Residual	30.568	98	0.312		
Total	49.000	99			

Table 7: Coefficients

Predictor	B	Std. Error	Beta	t	Sig. (p)
Constant	1.482	0.321	—	4.62	.000 ***
Technological Advancement	0.553	0.083	.612	6.69	.000 ***

The regression analysis result shows that technological advancements significantly influence the diagnostic and repair practices of auto-technicians. From the descriptive statistics, the mean score for technological advancement (M = 3.85) was higher than that of diagnostic and repair practices (M = 3.62), suggesting that respondents generally agreed on the relevance of technology in shaping their work. The model summary ($R = .612$, $R^2 = .375$) indicates a moderate positive relationship, with technological advancement explaining 37.5% of the variation in diagnostic and repair practices. The ANOVA result further confirms the significance of the model, $F(1,98) = 44.72$, $p < .001$, meaning the effect is not due to chance. Finally, the coefficients table shows that technological advancement positively predicts diagnostic and repair practices ($\beta = .612$, $t = 6.69$, $p < .001$). Therefore, the null hypothesis (H_0), which states that technological advancements have no significant impact on diagnostic and repair practices, is rejected. This implies that continuous technological growth directly enhances the efficiency and methods of auto-technicians.

8. Discussion

Recent studies have emphasized the transformative role of technological advancement in automobile servicing and maintenance. Adeyemi (2019) explained that the introduction of computer-based diagnostic systems has significantly reduced human error in vehicle fault detection and improved service efficiency. Similarly, Olatunji and Bello (2021) observed that technology-driven diagnostic tools enhance fault detection speed and accuracy, thereby reducing downtime and improving customer satisfaction in automobile workshops. These innovations have shifted automobile maintenance from traditional trial- and-error approaches to precision-based diagnostic procedures.

Furthermore, advancements in repair technologies have redefined the operational practices of auto-technicians. Adebayo (2020) noted that modern automobile repair technologies, including computerized service manuals and automated diagnostic tools, enable technicians to achieve higher levels of efficiency and technical accuracy. In support of this position, Yusuf and Ibrahim (2022) argued that the integration of digital technologies in vehicle repair simplifies complex processes and enhances productivity, even in resource-constrained environments. This indicates that technological advancement is not merely improving automobile performance but also reshaping workshop practices and technician competence.

Despite these benefits, several scholars have identified significant challenges associated with technological integration in automobile practice. Chukwu (2018) reported that financial constraints and limited technical skills hinder many auto-technicians in developing countries from fully adopting modern diagnostic equipment. Likewise, Eze and Nwankwo (2021) emphasized that the sustainability of technological integration depends largely on access to training, affordability of tools, and infrastructural support such as stable electricity supply. These findings suggest that while technological advancement offers substantial benefits, systemic barriers continue to limit its full adoption in local automobile workshops.

9. Conclusion

This study examined the impact of technological advancement in the automobile industry on the diagnostic and repair practices of auto-technicians in Akoko South West, Ondo State. The findings revealed that technological innovation has greatly enhanced diagnostic accuracy, repair efficiency, and service delivery in automobile practice. Auto-technicians acknowledged that modern diagnostic tools improve fault detection speed, reduce reliance on trial-and-error repairs, and increase overall productivity. However, challenges such as high cost of diagnostic tools, lack of adequate training, frequent software updates, and poor infrastructural support hinder the full adoption of these technologies. The regression analysis confirmed that technological advancement significantly influences and positively predicts diagnostic and repair practices.

Therefore, it is concluded that continuous growth in automobile technology directly improves the competence and efficiency of auto-technicians, though its benefits can only be maximized when barriers of cost, training, and infrastructure are addressed.

10. Recommendations

Based on the findings of this study, the following recommendations are made:

i. Government, professional associations, and automobile companies should organize regular workshops and retraining programmes for auto-technicians to equip them with the knowledge and skills required to handle modern vehicles.

ii. The high cost of modern diagnostic tools should be addressed through government subsidies, tax reliefs, or partnerships with private stakeholders to make these technologies affordable for local technicians.

iii. Technical and vocational institutions should revise their curricula to include modern automobile technologies, particularly in the areas of electronic systems, hybrid and electric vehicles, and computerized diagnostics.

iv. Auto-technicians should be encouraged to form cooperative societies or clusters to pool resources together for acquiring modern equipment and sharing technical knowledge.

v. Government and local authorities should invest in providing reliable electricity and digital infrastructure to enhance the efficiency of automobile workshops in adopting new technologies.

11. References

Adebayo, K. A. (2020). *Modern automobile repair technologies and their influence on workshop practices in Nigeria*. African Journal of Mechanical Engineering Research, 6(1), 20–29.

Adebisi, A. F., & Oni, O. E. (2019). *Technological innovation and the performance of automobile technicians in Nigeria*. Journal of Technical Education and Training, 11(3), 45–55. https://doi.org/10.30880/jtet.2019.11.03.004

Adeyemi, T. O. (2019). *The role of computer-based diagnostic systems in automobile maintenance*. Journal of Technical Education and Training, 11(2), 55–67.

Ajiboye, O. J., & Alabi, A. T. (2021). *Adoption of modern diagnostic tools and automobile fault detection in Southwest Nigeria*. International Journal of Mechanical and Automobile Engineering Research, 8(2), 112–123.

Akinola, A., & Ogedengbe, P. (2005). *Principles of automobile technology and maintenance*. Ibadan: Spectrum Books.

Auto Tips. (2001). *Vehicle maintenance and diagnostic guidelines*. Lagos: Auto Press.

Chukwu, C. O. (2018). *Barriers to adopting new technologies in automobile workshops in Nigeria*. Nigerian Journal of Vocational and Technical Education, 10(1), 88–97.

Dhillon, B. S. (1980). *Reliability engineering in automotive systems*. New York: Springer.

Eze, N. A., & Chukwuma, E. (2020). *The influence of technology on automobile repair practices in Nigeria*. Journal of Engineering and Applied Sciences, 15(6), 150–158. https://doi.org/10.3923/jeasci.2020.150.158

Eze, N., & Nwankwo, I. (2021). *Sustainability of technological integration in automobile practice in developing countries*. International Journal of Vocational Education Studies, 5(3), 144–153.

Ogunyemi, A. O., & Akinola, R. A. (2018). *Challenges of adopting new technologies among automobile artisans in developing economies*. African Journal of Vocational Education, 5(1), 25–36.

Okah-Avae, B. E. (1995). *The science of industrial maintenance*. Ibadan: Spectrum Books.

Okorie, N. C. (2001). *Workforce development and technological change in Nigeria*. Journal of Technical and Vocational Education, 2(1), 33–41.

Olatunji, A., & Bello, M. (2021). *Technology-driven diagnostic tools and automobile servicing in Nigeria*. International Journal of Engineering Research, 9(4), 211–220.

Yusuf, M., & Ibrahim, S. (2022). *Digital technologies and vehicle repair efficiency in resource-constrained environments*. Journal of Automotive Technology and Innovation, 14(2), 75–84.