
Impact of Digital Technology Skills on Capacity Building of Auto-Mechanic Graduates of Tertiary Institutions in Rivers State, Nigeria

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Abstract: *This study investigated the impact of digital technology skills on capacity building of auto-mechanic graduates of tertiary institutions in Rivers State, Nigeria. Specifically, the study sought to investigate: digital skills in auto-transmission maintenance and in braking maintenance on capacity building of auto-mechanic graduates in Rivers State. Two (2) research questions were posed and answered while two (2) hypotheses were formulated and tested at .05 level of significance. Descriptive research design was adopted. The population of the study comprised of all the twenty-three (23) lecturers of tertiary institutions offering automobile technology in Rivers State such as Ignatius Ajuru University of Education Port Harcourt, Rivers State University Port Harcourt and Federal Collage of Education (Technical) Omoku, Rivers State. The entire population of respondents was studied; hence the study was a census. A 23 items questionnaire titled: Digital Skills for Capacity Building of Auto-mechanic Graduates in Rivers State” was designed on a 5- point Likert scale of Very High Impact (VHI), High Impact (HI), Moderate Impact (MI), Low Impact (LI) and Very Low Impact (VLI) having ordinal values of 5,4,3,2 and 1 respectively was used for data collection. The face and content validity of the instrument was determined by three experts. A reliability coefficient of .64 was obtained using Cronbach Alpha. Data collected was analyzed using mean and standard deviation to answer the research questions while t-test was used to test the null hypotheses. A criterion mean of 3.50 was used in decision making. It was decided that “reject” the null hypotheses where t-cal. is greater than table t-table, but otherwise, “accept” the null hypotheses. The study found that digital technology skills in auto-transmission maintenance and braking maintenance have high impact on capacity building of auto-mechanic graduates in Rivers State. The study recommended amongst others that should automobile technology students should be provided with automobile maintenance software, packages and programmes in different automobile areas amongst which are auto-transmission maintenance and braking maintenance*

Keywords: Tertiary Education, Automobile Technology, Digital Technology and Capacity Building

Introduction

Tertiary education is referred to as the third-level, third-stage or post-secondary education following the completion of secondary education. Tertiary education leads to the award of an academic degree. Tertiary education in the view of Musset (2010) is an optional final stage of formal learning that occurs after completion of secondary education. Tertiary education is seen as a vehicle for advancing the frontier of knowledge. They are center for excellence, dedicated to research, teaching and learning. Tertiary institutions produce the human capital necessary for economic growth and development. Tertiary institutions are bedrock of national development (Jaja, 2017). According to Federal Republic of Nigeria (FRN, 2013), tertiary education is the education given after secondary education in colleges of education, polytechnics, monotechnics, universities and other institutions offering correspondence courses. Uyanga, et al., (2018) tertiary institution is taken to embody all organized learning and training activities at the tertiary level. This includes conventional universities, those with the conventional arts, humanities and science faculties as well as specialized universities like institutions agriculture, engineering, science, and technology. It also includes post-secondary institutions such as the polytechnics and colleges of education. Tertiary institutions according to Ochuba (2011), provides functional education for meeting the economic, political, social and cultural aspiration of a nation.

Tertiary institutions are also grouped into Public Institutions owned by the Federal and State Government and private Institutions owned by Individuals, Religious bodies and other private organizations. The goals of tertiary education encompass the development of relevant high level manpower, development of intellectual capability of individuals and acquisition of physical and intellectual skills. Tertiary education is instrumental in fostering growth, reducing poverty and boosting shared prosperity. Tertiary education has been recognized as a fundamental instrument for the construction of a knowledge economy and the development of human

capitals all over the world. According to Peretomode (2007) tertiary education is the facilitator, the bed rock, the power house and the driving force for the strong socio-economic, political, cultural, healthier and industrial development of a nation as higher education institutions are key mechanisms increasingly recognized as wealth and human capital producing industries. According to the authors, tertiary institutions offered several career-oriented courses aimed at arming graduates with skills to work in the chosen trade or profession among which is auto-mechanic technology.

Auto-mechanics technology is one of the mechanical trades offered in tertiary institutions in Nigeria. Auto-mechanic technology involves the application of scientific knowledge in the design, selection of materials, construction, operation, repairs, maintenance of tools and equipment (Owoso, et al, 2006). Auto-mechanic is a self-propelled land vehicle usually having four wheels and an internal combustion engine, used for personal and public transportation. Auto-mechanic consists of different systems available for efficient functioning of an engine which includes fuel supply system, lubrication system, ignition system, cooling system and governor. The goal of auto-mechanics in Nigeria is to produce competent vehicle mechanics with sound theoretical knowledge that should be able to diagnose and carryout repairs and/or maintenance on all types of diesel and petrol vehicles (NBTE, 2011). Thus, the programme for auto-mechanics in Nigeria tertiary institutions is designed to produce competent maintenance craftsmen for all types of motor vehicle. It is of assorted brand with respect to its styles, number of doors and purpose of uses (Abwage, 2011).

Auto-mechanic technology work deals with servicing, repair and maintenance of motor vehicle. Eruanga (2011) posited that auto-mechanic technology provides the students with the knowledge and skills with adequate practical experience in the field of professional motor vehicle mechanics technology for national development. Auto-mechanic technology involves the application of scientific knowledge in the design selection of materials, construction, operation and maintenance of the motor vehicles. Auto-mechanic could be seen as an aspect of educational training process which automobile trainees receive with the primary motive of enabling them to acquire adequate attitudes, concepts, knowledge, understanding and skills in automobile activities, for personal or vocational usage, and/or for careers as administrators, managers and teachers wherever they may find themselves.

In the auto-mechanic industry, digital skills and innovations could generate radical improvements in terms of sustainability, efficiency and safety. Digital technology becomes embedded in the core of customer offerings, companies find themselves being part of dynamic networks and must develop more open and distributed innovation processes. The transformative impact on industrial-age physical products, especially of the automotive industry, has remained unnoticed in the Information System literature for years (Yoo et al., 2010). The unique properties of digital technology and the structure of digital products enable new types of innovation processes that are rapid and difficult to control and predict (Nylén and Holmström, 2015). However, an automobile is becoming a computing platform for networks, services and content (Henfridsson & Lindgren, 2010). In corroboration with the above, Fürst et al. (2009) opined that most subsystems of a vehicle are digitized and digitally integrated, through e.g. the AUTOSAR standard. A Therefore, automotive companies try to attract external software developers by establishing new organizational forms for open digital innovation. Yoo, et al. (2010) and Yoo, et al. (2012), noted that by separating the logic from the physical form, a digital device can provide many reprogrammable functions. To better take advantage of the opportunities that digital technology brings to product innovation, automotive companies try to attract external software start-ups and creative programmers by organizational interventions. These skills are capable of enhancing and sustaining nation's growth and build human capacity.

Hence, capacity building as a concept is defined by, Chukwu (2009) describes capacity building as the process of developing skills and knowledge needed by groups in order to discharge their duties effectively in the labour market. Similarly, Egbo (2011) as the process by which adequate skill, knowledge and expertise is achieved over time by an individual which enables him to become proficient in his job role. United Nations Development Project (UNDP) (2015), capacity building is a long-term continuing process of development involving all stakeholders including ministries, local authorities, non-governmental organizations, professionals, academics and many more stakeholders which entails the utilization of a country's human, scientific, technological, organizational, institutional resources and capabilities to achieve increased productivity.

Statement of Problem

Technology-driven trends have always been revolutionizing the way in which automotive industry players react to the changing behaviour of consumers. Today's automobile is an extremely complex and technological sophisticated product with more than 3000 parts that all need to work in harmony and consecutively. The current global trend is a crucial aspect of a digitally-enabled merging of social, and technological forces to ignite an outburst of innovation in the global transportation arena. However, this has created a very big lacuna between manufacturing and repairs of broken-down vehicle by auto-mechanic technology graduates of tertiary institutions in Rivers State, Nigeria who are still depending on the old and obsolete skills acquired many years ago in today's world of works. Agreeing with the above, Kotarba, (2018) and Riasanow, et al. (2017) posited that institutions have to change traditional business and teaching models, which have been robust for many decades, and transform their institutions to adapt these trends (new telematics services). According to the researchers, today's workplace demands that automobile graduates possess a corresponding

digital technology skill alongside the automobile manufacturing industries to enable them repair and maintain current technologically complex and sophisticated automobile vehicles. To this end, the present study sought to investigate the impact of digital technology skills on capacity building of auto-mechanic graduates of tertiary institutions in Rivers State, Nigeria.

Purpose of the Study

The purpose of the study was to investigate the impact of digital technology skills on capacity building of auto-mechanic graduates of tertiary institutions in Rivers State, Nigeria. Specifically, the study sought to investigate;

1. Impact of digital skills in auto-transmission maintenance on capacity building of auto-mechanic graduates in Rivers State
2. Impact of digital skills in braking maintenance on capacity building of auto-mechanic graduates in Rivers State

Research Questions

The following two (2) research questions were posed to guide the study

- 1) What is the impact of digital skills in auto-transmission maintenance system on capacity building of auto-mechanic graduates in Rivers State?
- 2) What is the impact of digital skills in braking maintenance system on capacity building of auto-mechanic graduates in Rivers State?

Hypotheses

Two (2) hypotheses were formulated to guide the study at .05 level of significance.

H₀₁: There is no significant difference between the mean responses of auto-mechanic lecturers of Federal Collage of Education (Technical) and Universities on impact of digital skills in auto-transmission on capacity building of auto-mechanic graduates in Rivers State.

H₀₂: There is no significant difference between the mean responses of auto-mechanic lecturers of Federal Collage of Education (Technical) and Universities on impact of digital skills in braking maintenance system on capacity building of auto-mechanic graduates in Rivers State

Method

Research Design: A descriptive survey research design was adopted.

Population of the Study: The population of the study comprised of all the twenty-three (23) lecturers of tertiary institutions offering automobile technology in Rivers State such as Ignatius Ajuru University of Education Port Harcourt, Rivers State University Port Harcourt and Federal Collage of Education (Technical) Omoku, Rivers State.

Sample and Sampling Techniques: The entire population of respondents was studied; hence the study was a census.

Instrument: The instrument for data collection was a researcher's designed questionnaire which comprised 23-items. The instrument titled "*Digital Skills for Capacity Building of Auto-mechanic Graduates in Rivers State*" was designed on a 5- point Likert scale of Very High Impact (VHI), High Impact (HI), Moderate Impact (MI), Low Impact (LI) and Very Low Impact (VLI) having ordinal values of 5,4,3,2 and 1 respectively.

Validity of Instrument: The instrument for the study validated by three (3) experts; one (1) drawn from Department of Technical Education (Automobile Technology Option), Ignatius Ajuru University of Education Port Harcourt, and one (1) from Department of Vocational Technology Education (Automobile Technology Option), Rivers State University Port Harcourt and Department of Automobile Technology, Federal College of Education (Technical) Omoku, Rivers State.

Reliability of the Instrument: The reliability of the instrument was calculated using Cronbach Alpha reliability coefficient and .64 was obtained.

Data Analysis: Data collected for the study was analyzed using mean and standard deviation and an inferential statistic of t-test was used to test the null hypotheses at .05 level of significance. A criterion mean value 3.5 used as the yardstick for decision making.

Furthermore, it was decided that “reject” the null hypotheses where t-cal. is greater than table t-table, but otherwise, “accept” the null hypotheses.

Analysis of Results

Research Question 1: What is the impact of digital skills in auto-transmission maintenance system on capacity building of auto-mechanic graduates in Rivers State?

Table 1: Mean and Standard Deviation of University and FCE_(T) Lecturers on impact of digital skills in auto-transmission maintenance system

S/N	ITEMS	University Lecturers N=14			FCE _(T) N=9		
		\bar{X}_1	SD ₁	Rmk	\bar{X}_2	SD ₂	Rmk
1	Identify on-board diagnostic port in vehicle	3.65	0.92	HI	3.96	0.77	HI
2	Retrieve transmission Diagnostic Trouble Code	4.29	0.84		4.20	0.83	HI
3	Interpret transmission Diagnostic Trouble Code (DTC's)	4.19	0.97	HI	3.76	0.92	HI
4	Inspect transmission linkage	3.58	0.81	HI	3.65	0.98	HI
5	Inspect and adjust the shift cable	3.88	0.81	HI	3.92	0.86	HI
6	Conduct fluid level check from transmission vent	4.15	0.82	HI	4.10	1.04	HI
7	Check transmission fluid and filters for oxidation	4.15	0.82	HI	3.88	0.81	HI
8	Check drive train for leaks or looseness	4.03	0.79	HI	4.04	0.95	HI
9	Remove and reinstall new gasket to correct fluid leakage	4.65	0.65	HI	4.22	0.74	HI
10	Check torque converter for leaks	4.04	0.94	HI	3.94	0.85	HI
11	Check transmission vent for blockage	4.68	0.58	HI			HI
12	Replacement of O-ring and gear	4.03	0.81	HI	4.02	0.93	HI
13	Diagnose noise and vibration problem	3.94	0.85	HI	4.05	1.2	HI
Average Mean		4.09	.81	HI	3.97	.90	HI

Source: Authors (2023)

Key: HI = High Impact

Table 1 above shows the responses of University lecturers and Federal College of Education (Technical) Lecturers on impact of digital skills in auto-transmission maintenance system on capacity building of auto-mechanic graduates in Rivers State. The table above, portrayed the average mean and standard deviation scores of University lecturers and Federal College of Education (Technical) Lecturers which ranges from 3.97- 4.09 and standard deviation between 0.81 - 0.90 respectively. The study found that identify on-board diagnostic port in vehicle, interpret transmission Diagnostic Trouble Code (DTC's), conduct fluid level check from transmission vent, check transmission fluid and filters for oxidation, check torque converter for leaks, diagnose noise and vibration problem amongst others are digital skills in auto-transmission maintenance system for capacity building of auto-mechanic graduates in Rivers State.

Research Question 2: What is the impact of digital skills in braking maintenance system on capacity building of auto-mechanic graduates in Rivers State?

Table 2: Mean and Standard Deviation of University and FCE_(T) Lecturers on impact of digital skills in auto-transmission maintenance system

S/N	ITEMS	University Lecturers N=14			FCE _(T) N=9		
		\bar{X}_1	SD ₁	Rmk	\bar{X}_2	SD ₂	Rmk
1	Inspect of wheel speed sensor and cables	4.10	1.04	HI	4.15	0.78	HI
2	Identify defective wheel speed sensor	4.13	1.16	HI	3.83	0.85	HI
3	Check wheel speed sensor and the pulse ring	4.04	0.95	HI	3.97	0.79	HI
4	Carry out speed sensor signal testing	3.94	0.85	HI	3.58	0.89	HI
5	Service the wheel speed sensor	4.08	0.85	HI	4.07	0.88	HI
6	Adjust and replace wheel speed sensor	3.65	0.98	HI	3.73	0.97	HI
7	Check supply voltage and signals with oscilloscope	4.68	0.58	HI	4.05	0.84	HI
8	Identifying defective Anti-lock Braking System (ABS) warning light	4.05	1.2	HI	3.98	0.76	HI

9	Inspect and service wheel speed sensor	3.76	0.92	HI	3.76	0.51	HI
10	Replace electrical wiring to the wheel speed sensor	4.19	0.97	HI	4.12	0.88	HI
11	Diagnose all kinds of mathematical tests on braking system	4.20	0.83	HI	4.16	0.87	HI
Average Mean		4.07	.83	HI	3.94	.82	HI

Source: Authors (2023)

Key: HI = High Impact

Table 2 above shows the responses of University lecturers and Federal College of Education (Technical) Lecturers on impact of digital skills in braking maintenance system on capacity building of auto-mechanic graduates in Rivers State. The table above, portrayed the average mean and standard deviation scores of University lecturers and Federal College of Education (Technical) Lecturers which ranges from 3.94 - 4.07 and standard deviation between .82 - .83 respectively. The study found inspection of wheel speed sensor and cables, identify defective wheel speed sensor, inspect and service wheel speed sensor, replace electrical wiring to the wheel speed sensor amongst others are digital technology skills in braking maintenance have high impact on capacity building of auto-mechanic graduates in Rivers State.

Hypothesis 1

There is no significant difference between the mean responses of auto-mechanic lecturers of Universities and Federal Collage of Education (Technical) on impact of digital skills in auto-transmission on capacity building of auto-mechanic graduates in Rivers State

Table 3: t-test analysis of University and FCE_(T) Lecturers on digital skills in auto-transmission for capacity building of auto-mechanic graduates

Respondents	N	\bar{X}	SD	df	Sig. Level	t-cal	t-crit	Decision
University Lecturers	14	4.09	.81	21	.05	.324	2.06	Accept
FCE _(T) Lecturers	9	3.97	.90					

Source: Author (2023)

Table 3 above revealed that t-calculated is (.324) whereas the t-critical (table value) was (2.06) in a two-tailed study. However, since the calculated mean is less than the critical or table value, the null hypothesis which reads “there is no significant difference between the mean responses of auto-mechanic lecturers of Universities and Federal Collage of Education (Technical) on impact of digital skills in auto-transmission on capacity building of auto-mechanic graduates in Rivers State” was accepted. This means that there is high impact of digital skills in auto-transmission on capacity building of auto-mechanic graduates in Rivers State.

Hypothesis 2

There is no significant difference between the mean responses of auto-mechanic lecturers of Universities and Federal Collage of Education (Technical) on impact of digital skills in braking maintenance system for capacity building of auto-mechanic graduates in Rivers State

Table 4: t-test analysis of University and FCE_(T) Lecturers on digital skills in braking maintenance system for capacity building of auto-mechanic graduates

Respondents	N	\bar{X}	SD	df	Sig. Level	t-cal	t-crit	Decision
University Lecturers	14	4.07	.83	21	.05	.379	2.06	Accept
FCE _(T) Lecturers	9	3.94	.82					

Source: Author (2023)

Table 4 above revealed that t-calculated is (.379) whereas the t-critical (table value) was (2.06) in a two-tailed study. However, since the calculated mean is less than the critical or table value, the null hypothesis which reads “there is no significant difference between the mean responses of auto-mechanic lecturers of Universities and Federal Collage of Education (Technical) on impact of digital skills in braking maintenance system on capacity building of auto-mechanic graduates in Rivers State” was accepted. This means

that there is high impact of digital skills in braking maintenance system for capacity building of auto-mechanic graduates in Rivers State.

Discussion of Findings

Table 1 above shows the responses of University lecturers and Federal College of Education (Technical) Lecturers on impact of digital skills in auto-transmission maintenance system on capacity building of auto-mechanic graduates in Rivers State. The table above, portrayed the average mean and standard deviation scores of University lecturers and Federal College of Education (Technical) Lecturers which ranges from 3.97- 4.09 and standard deviation between 0.81 - 0.90 respectively. The study found that identify on-board diagnostic port in vehicle, interpret transmission Diagnostic Trouble Code (DTC's), conduct fluid level check from transmission vent, check transmission fluid and filters for oxidation, check torque converter for leaks, diagnose noise and vibration problem amongst others are digital skills in auto-transmission maintenance system for capacity building of auto-mechanic graduates in Rivers State.

Furthermore, analysis on table 3 above revealed that t-calculated is (.324) whereas the t-critical (table value) was (2.06) in a two-tailed study. However, since the calculated mean is less than the critical or table value, the null hypothesis which reads "there is no significant difference between the mean responses of auto-mechanic lecturers of Universities and Federal Collage of Education (Technical) on impact of digital skills in auto-transmission on capacity building of auto-mechanic graduates in Rivers State" was accepted. This means that there is high impact of digital skills in auto-transmission on capacity building of auto-mechanic graduates in Rivers State. This finding is in line with Wijnen, (2013); Simonji-Elias et al., (2014); Gao et al., (2016) pointed that digital innovations like self-driving cars, connectivity, big data, and social networks are fundamentally revolutionizing the automotive industry. Hanelt et al. (2015) combine the phenomena of digital and physical world and explore the impact of digital trends on the business model of the automotive industry.

Table 2 above shows the responses of University lecturers and Federal College of Education (Technical) Lecturers on impact of digital skills in braking maintenance system on capacity building of auto-mechanic graduates in Rivers State. The table above, portrayed the average mean and standard deviation scores of University lecturers and Federal College of Education (Technical) Lecturers which ranges from 3.94 - 4.07 and standard deviation between .82 - .83 respectively. The study found Inspect of wheel speed sensor and cables, identify defective wheel speed sensor, inspect and service wheel speed sensor, replace electrical wiring to the wheel speed sensor amongst others are digital skills in braking maintenance system for capacity building of auto-mechanic graduates in Rivers State.

More so, analysis on table 4 above revealed that t-calculated is (.379) whereas the t-critical (table value) was (2.06) in a two-tailed study. However, since the calculated mean is less than the critical or table value, the null hypothesis which reads "there is no significant difference between the mean responses of auto-mechanic lecturers of Universities and Federal Collage of Education (Technical) on impact of digital skills in braking maintenance system on capacity building of auto-mechanic graduates in Rivers State" was accepted. This means that there is high impact of digital skills in braking maintenance system for capacity building of auto-mechanic graduates in Rivers State. This finding is congruence with Hildebrandt et al. (2015) found that digital technology-related merger and acquisitions have a positive impact on digital business model innovations. Automobile personnel have to acquire external knowledge to capture the potential of digital innovations (Henfridsson & Lind, 2014).

Conclusion

The study examined the impact of digital technology skills on capacity building of auto-mechanic graduates of tertiary institutions in Rivers State. In line with the findings of the present study, the researchers conclude that digital technology skills have high impact on capacity building of auto-mechanic graduates of tertiary institutions in Rivers State. The study which investigated on digital skills in auto-transmission maintenance skills and braking maintenance skills found that digital skills are significant in capacity building of auto-mechanic graduates of tertiary institutions in Rivers State.

Recommendations

The following recommendations were made in line with the findings of the study.

1. Automobile technology students should be provided with automobile maintenance software, packages and programmes in different automobile areas amongst which are auto-transmission maintenance and braking maintenance in Rivers State.
2. Train the trainer: Automobile technology lecturers should be trained on the application of digital technology skills in maintenance of vehicle
3. Integration of digital technology skills into automobile technology curriculum in tertiary institutions for enhanced capacity building of graduates.

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