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GENDER, INSTITUTIONAL AND LOCATION DIFFERENCE IN THE PERCEIVED USEFULNESS AND EASE OF USE OF INTERNET OF THINGS AS INSTRUCTIONAL TOOL AMONG TVET EDUCATORS IN RIVERS AND BAYELSA STATES, NIGERIA

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Abstract

Technology plays important role of enhancing teaching and learning in Technical and Vocational Education and Training (TVET). Achieving this goal depends on TVET educators' utilization of these technologies. However, utilization of these technologies is a function of the perception of these TVET educators. The present study investigated influence of selected demographic characteristic (gender, institutional type and location) on perceived usefulness and perceived ease of use of Internet of Things (IoTs) among TVET teachers and TVET teacher educators in Rivers and Bayelsa states within South-South Nigeria. The study adopted an ex post facto research design. The study participants included 149 TVET educators from Rivers and Bayelsa States in South-South Nigeria obtained through convenience and snowball sampling technique. Data was collected using a structured questionnaire administered electronically through Google Forms. Descriptive (mean) and inferential statistics (t-test and one way analysis of variance) were used to analyze data. The results of the study showed that there was no significant gender, institutional type and location difference in the perceive usefulness and ease of use of IoTs as instructional tool among TVET educators in Bayelsa and Rivers States. Based on the findings, it was recommended among others that TVET programmes and professional bodies such as TEPAN should design and implement standardized IoTs capacity-building programmes for all TVET educators, rather than developing separate interventions targeted at specific demographic groups, as this would be a more efficient use of resources.

***Keywords*:** Internet of Things, IoT, perceived usefulness, perceived ease of use, demographic characteristics, TVET teachers, TVET teacher educators.

Introduction

The advancement in technology, resulting to the fourth and fifth industrial revolution is reshaping various industries today and the educational sector is not left out. One of the advancements in technology influencing the industrial sector today is the Internet of Things (IoTs). It is a system of interconnected physical devices embedded with sensors and software designed to collect, process and transmit data over the internet or other communication networks without direct human interference (Ahmed

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et al., 2018; Al-Taai et al., 2023; IBM, 2023; McEwen & Cassimally, 2014; Pfister, 2011). IoTs systems have smart devices which can be used to aid smart classrooms, remote monitoring of equipment, real-time data collection, automated laboratory activities and interconnected learning environments (Tariq et al., 2024). In Technical and Vocational Education and Training (TVET), where competence-based, hands-on instruction is fundamental, IoTs offers opportunities to bridge the gap between classroom instruction and modern industrial practices. Consequently, availability of this technology could provide opportunities for enhancing delivery in TVET. However, the educational value of IoTs cannot be realized solely through its availability or technical capabilities. The extent to which IoTs is integrated into instructional practice depends largely on the perceptions of TVET practitioners, who ultimately decide whether, how, and to what extent the technology is adopted in teaching. Positive perceptions often encourage experimentation, acceptance and sustained utilization. On the other hand, negative perceptions may lead to resistance, underutilization or outright rejection of the technology.

Importantly, perceptions of educational technologies are rarely uniform across all educators. Reports from empirical investigations on technology adoption suggest that demographic characteristics such as gender and institutional type among others influence the perception of the usefulness and the ease of use of technologies. For example, Tun et al. (2021) reported that gender and type of school had significant influence on perception of Industry 4.0 among TVET teachers in Myanmar. On the other hand, Lokpo and Kumah (2023) found that there was no gender difference in the perception of ICT integration in instructional delivery in volta region of Ghana. A study by Akuegwu et al. (2011) found difference in the utilization of information and communication technology between two states: Cross Rivers State and Akwa Ibom States. TVET practitioners in South-South Nigeria has heterogenous characteristics with individual members coming from different states, gender and institutions. These demographic characteristics can influence the perception of IoTs as instructional tool among these TVET practitioners. Understanding the influence of demographic characteristics on perceptions of IoTs among these TVET practitioners is essential for designing targeted capacity-building programmes, informed policy interventions, equitable technology deployment and effective professional development strategies that promote meaningful integration of IoTs into TVET instruction.

Existing empirical studies indicate increasing interest in the application of the Internet of Things (IoT) in education and Technical and Vocational Education and Training (TVET). Findings from these studies suggest that IoT has potential to enhance teaching and learning through smart learning environments, remote laboratories, learning analytics, cyber-physical systems, intelligent school

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management, and improved practical skill acquisition (Al-Taai et al., 2023; Bakla, 2022; Sapale & Banerjee, 2023; Tariq et al., 2024). Within the TVET context, studies have shown that IoT supports vocational competence development, strengthens industry-oriented training, enhances students' production competencies, and improves institutional innovation and technology-based learning (Vihervaara & Alapaholuoma, 2017; Willyarto & Paramitha, 2023; Yoddumnern, 2025). Similarly, studies conducted in Nigerian highlight the relevance of IoT for educational and institutional improvement, including students' healthcare systems and workforce preparation (Takpor & Atayero, 2015; Abdul-Hameed et al., 2026; Oni, 2026). Research examining teachers' perceptions generally reported positive attitudes towards IoTs and related educational technologies. They further identified perceived usefulness, facilitating conditions, institutional support, technological infrastructure, digital competence, and behavioural intention as important determinants of adoption and utilization (Moreira et al., 2024; Mohamed et al., 2025; Shaqrah & Almars, 2022). Although studies on AI, ICT, and Web 4.0 technologies similarly indicate positive perceptions among TVET educators, they have primarily examined technology readiness, digital competence, or technology acceptance rather than perception of IoT as instructional tools (Gui et al., 2026; Nwakile et al., 2026; Umoh et al., 2026; Zhang et al., 2026).

Despite the contributions of these studies, there still exist some gaps. First, much of the existing literature has concentrated on the educational applications, adoption, implementation, curriculum integration and technological benefits of IoTs rather than on practitioners' perceptions of IoT as instructional tools (Al-Taai et al., 2023; Bakla, 2022; Sapale & Banerjee, 2023; Tariq et al., 2024; Vihervaara & Alapaholuoma, 2017; Yoddumnern, 2025). Second, studies which examined teachers' perceptions have largely focused on perception, awareness, behavioural intention, or technology acceptance without investigating how demographic characteristics shape these perceptions (Moreira et al., 2024; Mohamed et al., 2025; Shaqrah & Almars, 2022). Third, the few studies conducted within the TVET context have predominantly investigated students, curriculum development, institutional readiness, or workforce preparation, with limited attention given to TVET teachers and TVET teacher educators as the unit of analysis (Abdul-Hameed et al., 2026; Oni, 2026; Willyarto & Paramitha, 2023; Yoddumnern, 2025). Furthermore, empirical evidence from Nigeria remains scarce and no known study has specifically examined the influence of demographic characteristics such as gender and institutional type and state on the perception of IoTs as instructional tools among TVET teachers and TVET teacher educators in South-South Nigeria. This contextual and methodological gap provides the justification for the present study, which sought to provide evidence capable of informing policy, professional development and the effective integration of IoT into TVET instruction.

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This study is anchored on the Technology Acceptance Model (TAM). The theory was originally proposed by Davis (1989) as a framework for explaining and predicting individuals' acceptance of information technology. TAM was developed from the Theory of Reasoned Action (Fishbein and Ajzen 1975) and has been used extensively as the theoretical basis for empirical studies focusing on user acceptance of technology across different contexts including education. The model was built on two cognitive beliefs. The first is perceived usefulness which refers to the extent to which a person believes that using a particular technology will enhance his or her performance. The second is perceived ease of use which refers to the degree to which a person believes that use of a particular technology will be free of effort. These two beliefs jointly shape an individual's attitude toward a technology, which in turn shapes behavioural intention and, ultimately, actual system use (Davis, 1989). TAM has relevance to this study because it directly addresses how TVET teachers and TVET teacher educators form perceptions of IoTs before they adopt or reject it (Venkatesh & Morris 2000).

Since its introduction, TAM has undergone several theoretical extensions relevant to the focus of the present study on influence od demographic characteristics. Venkatesh and Davis (2000) proposed TAM2, which extended the original model by identifying antecedents of perceived usefulness, including subjective norm, image, job relevance, output quality and result demonstrability, thereby situating individual technology perception within a wider social and organisational context. Venkatesh and Bala (2008) subsequently integrated TAM2 with the determinants of perceived ease of use to produce TAM3. In TAM3, differences, system characteristics, social influence, and facilitating conditions were incorporated as determinants of both perceived usefulness and perceived ease of use. Building further on this trajectory, Venkatesh et al. (2003) developed the Unified Theory of Acceptance and Use of Technology (UTAUT), which integrated insights from multiple acceptance models while explicitly accounting for demographic and experiential variables such as age, gender, and experience as moderators of technology acceptance. This progression in the TAM family of models provides direct theoretical justification for examining demographic characteristics. The present study focuses on the influence of institution type, gender and state on perception of IoTs as instructional tools among TVET teachers and TVET teacher educators in South-South Nigeria. Based on this theoretical lens and summary of empirical studies a conceptual framework shown in Figure 1 emerged.

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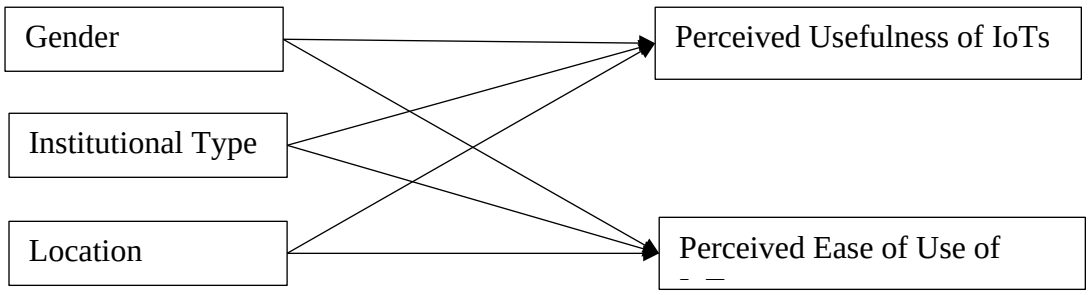

Figure 1: Conceptual Framework for Influence of Gender, Institutional Type and Location on Perceived Usefulness and Perceived Ease of Use of IoTs

The conceptual framework for this study shown in Figure 1 is based on the premise that demographic characteristics of TVET educators influence their perception of the usefulness and ease of use of IoTs as instructional tools. Gender refers to the biological classification of respondents as male or female. Institutional type refers to the category of educational institution in which respondents teach, namely technical colleges, colleges of education, polytechnics, and universities. Location refers to the state of the South-South Nigeria where the respondent's institution is located (Bayelsa and Rivers). These demographic characteristics serve as independent variables. Perceived usefulness of IoTs refers to the extent TVET educators believe that integrating IoTs into instructional delivery would improve teaching effectiveness, enhance students' learning experiences, increase instructional efficiency, and support competence-based education. Perceived ease of use refers to the extent to which respondents believe that learning, operating, and integrating IoT technologies into instructional activities would be simple, understandable, and require minimal effort (Davis, 1989). The framework proposes that differences in gender, institutional type, and location may result in differences in TVET practitioners' perceived usefulness and perceived ease of use of IoT as instructional tools.

Purpose of the Study

The purpose of this study was to find out the influence of selected demographic characteristic (gender, institutional type and location) on perceived usefulness and perceived ease of use of Internet of Things (IoTs) among TVET teachers and TVET teacher educators in Rivers and Bayelsa states within South-South Nigeria. The specific objectives of the study were to:

1. ascertain whether there is a significant difference in the perceived usefulness of IoTs as instructional tool based on gender among TVET teachers and TVET teacher educators in Rivers and Bayelsa States.

2. determine whether there is a significant difference in the perceived ease

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of use of IoTs as instructional tool based on gender among TVET teachers and TVET teacher educators in Rivers and Bayelsa States.

3. deduce whether there is a significant difference in the perceived usefulness of IoTs as instructional tool based on institutional type among TVET teachers and TVET teacher educators in Rivers and Bayelsa States.

4. find out whether there is a significant difference in the perceived ease of use of IoTs as instructional tool based on institutional type among TVET teachers and TVET teacher educators in Rivers and Bayelsa States.

5. Determine whether there is a significant difference in the perceived usefulness of IoTs as instructional tool based on location among TVET teachers and TVET teacher educators in Rivers and Bayelsa States.

6. ascertain whether there is a significant difference in the perceived ease of use of IoTs as instructional tool based on location among TVET teachers and TVET teacher educators in Rivers and Bayelsa States.

Research Questions

The study was guided by the following six research questions

1. Is there a significant difference in the perceived usefulness of IoTs as instructional tool based on gender among TVET teachers and TVET teacher educators in Rivers and Bayelsa States?

2. Is there a significant difference in the perceived ease of use of IoTs as instructional tool based on gender among TVET teachers and TVET teacher educators in Rivers and Bayelsa States?

3. Is there a significant difference in the perceived usefulness of IoTs as instructional tool based on institutional type among TVET teachers and TVET teacher educators in Rivers and Bayelsa States?

4. Is there a significant difference in the perceived ease of use of IoTs as instructional tool based on institutional type among TVET teachers and TVET teacher educators in Rivers and Bayelsa States?

5. Is there a significant difference in the perceived usefulness of IoTs as instructional tool based on location among TVET teachers and TVET teacher educators in Rivers and Bayelsa States?

6. Is there a significant difference in the perceived ease of use of IoTs as instructional tool based on location among TVET teachers and TVET teacher educators in Rivers and Bayelsa States?

Methodology

This study adopted a causal-comparative (ex post facto) survey research design to examine the influence of demographic

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characteristics on the perceived usefulness and perceived ease of use of the Internet of Things (IoT) as instructional tools among TVET teachers and TVET teacher educators in South-South Nigeria. The design was considered appropriate because the independent variables (gender, institutional type, and state) were naturally existing characteristics that could not be manipulated by the researchers. The population of the study comprised all TVET teachers from technical colleges and polytechnics as well as TVET teacher educators from universities and colleges of education offering technical and vocational education programmes across the six states of South-South Nigeria. The numerical figure for this population was not known. Consequently, convenience and snowball sampling techniques were used to recruit participants for the study. The participants included TVET teachers and TVET teacher educators in trade-related disciplines such as Electrical/Electronic Technology, Building Technology, Welding and Fabrication, Woodwork, Automobile Technology, and related vocational specializations. Data were collected using a structured online questionnaire developed on Google Forms and distributed electronically through institutional and professional networks. The instrument measured respondents' perceptions of the usefulness and ease of use of IoT in instructional delivery. It also collected demographic information. Descriptive statistics (mean and standard deviation) were used to answer the research questions, while inferential statistics: independent-samples *t*-test was used to test the first hypothesis. One-way analysis of variance (ANOVA) was used to test the second and third hypotheses. All the hypotheses were tested at 0.05 level of significance. A total of 166 responses were received from across the institutions and states within South-South, Nigeria.

Results

Research Question 1: Is there a significant difference in the perceived usefulness of IoTs as instructional tool based on gender among TVET teachers and TVET teacher educators in Rivers and Bayelsa States?

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Table 1: Mean for influence of gender on perceived usefulness of IoTs

S/N	Perceived Usefulness	Female (n = 43)			Male (n = 106)			t-test
		M	SD	RMK	M	SD	RMK	
1	Using IoTs will improve my instructional effectiveness.	4.67	0.57	Agree	4.55	0.69	Agree	t = 1.78
2	IoTs will enhance students' learning outcomes.	4.60	0.58	Agree	4.51	0.64	Agree	p = 0.077
3	IoTs will make teaching more efficient.	4.60	0.62	Agree	4.44	0.69	Agree	df = 147
4	IoTs is useful for practical training programme like TVET.	4.51	0.63	Agree	4.16	0.82	Agree	Decision = fail to reject
	Grand Mean	4.60	0.52	Agree	4.42	0.59	Agree	

Field Data, 2026

The result in Table 1 shows grand means of 4.60 for female and 4.42 for male respondents from the study area. The result shows that both male and female TVET teachers and TVET teacher educators have positive perception of the usefulness of IoTs as instructional tool. This suggests that there is similarity in their views. The result also shows t (df = 147) = 1.78, p = 0.077 > 0.05. This is an indication that there is no significant difference in the perceived usefulness of IoTs as instructional tool based on gender among TVET teachers and TVET teacher educators in Rivers and Bayelsa States.

Research Question 2: Is there a significant difference in the perceived ease of use of IoTs as instructional tool based on gender among TVET teachers and TVET teacher educators in Rivers and Bayelsa States?

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Table 2: Mean for influence of gender on perceived ease of use of IoTs

S/N	Perceived Ease of Use	Female (n = 43)			Male (n = 106)			
		M	SD	RMK	M	SD	RMK	t-test
1	Learning to use IoTs tools is easy for me.	4.09	0.78	Agree	3.93	0.81	Agree	t = 0.025
2	It is easy for me to operate IoTs tools.	3.88	0.91	Agree	3.98	0.76	Agree	p = 0.980
3	It is easy for me to integrate IoT into my teaching.	3.95	0.79	Agree	3.97	0.84	Agree	df = 147
4	Using IoTs will not require much effort from me.	3.84	0.90	Agree	3.87	0.92	Agree	Decision = fail to reject
	Grand Mean	3.94		Agree	3.94		Agree	

Field Data, 2026

The result in Table 2 shows grand means of 3.94 for female and 3.94 for male respondents from the study area. The result shows that both male and female TVET teachers and TVET teacher educators have positive perception of the ease of use of IoTs as instructional tool. This suggests that there is similarity in their views. The result also shows t (df = 147) = 0.025, p = 0.980 > 0.05. This is an indication that there is no significant difference in the perceived ease of use of IoTs as instructional tool based on gender among TVET teachers and TVET teacher educators in Rivers and Bayelsa States.

Research Question 3: Is there a significant difference in the perceived usefulness of IoTs as instructional tool based on institutional type among TVET teachers and TVET teacher educators in Rivers and Bayelsa States?

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Table 3: Mean for influence of institutional type on perceived usefulness of IoTs

S/N	Perceived Usefulness by Institution	College of Education (n = 13)			Polytechnic (n = 55)			Technical College (n = 32)			University (n = 41)			Other (n = 8)		
		M	SD	RMK	M	SD	RMK	M	SD	RMK	M	SD	RMK	M	SD	RMK
1	Using IoTs will improve my instructional effectiveness.	4.62	0.65	Agree	4.49	0.69	Agree	4.41	0.80	Agree	4.83	0.38	Agree	4.63	0.74	Agree
2	IoTs will enhance students' learning outcomes.	4.31	0.63	Agree	4.49	0.63	Agree	4.63	0.61	Agree	4.63	0.58	Agree	4.38	0.74	Agree
3	IoTs will make teaching more efficient.	4.46	0.66	Agree	4.40	0.68	Agree	4.41	0.80	Agree	4.68	0.52	Agree	4.50	0.76	Agree
4	IoTs is useful for practical training programme like tvet.	4.31	0.75	Agree	4.29	0.74	Agree	4.13	0.94	Agree	4.32	0.76	Agree	4.25	0.71	Agree
	Grand Mean	4.42	0.55	Agree	4.42	0.59	Agree	4.39	0.67	Agree	4.62	0.45	Agree	4.44	0.69	Agree

Field Data, 2026

The result in Table 3 shows grand means of 4.42, 4.42, 4.39, 4.62 and 4.44 for respondents from colleges of education, polytechnics, technical colleges, universities and others respectively. The result shows that there is similarity in the responses of TVET teachers and TVET teacher educators from these different institutions regarding the usefulness of IoTs as instructional tool. The result Table 4 shows F (4, 144) = 0.950, p = 0.437 > 0.05. This is an indication that there is no significant difference in the perceived usefulness of IoTs as instructional tools based on institutional type among TVET teachers and TVET teacher educators in Rivers and Bayelsa States.

Table 4: ANOVA-test for influence of institutional type on perceived usefulness of IoTs

Sources	Sum of Squares	df	Mean Square	F	p-value	Decision
Between Groups	1.258	4	0.315	0.950	0.437	Fail to Reject
Within Groups	47.653	144	0.331			
Total	48.911	148				

Field Data, 2026

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Research Question 4: Is there a significant difference in the perceived ease of use of IoTs as instructional tool based on institutional type among TVET teachers and TVET teacher educators in Rivers and Bayelsa States?

Table 5: Mean for influence of institutional type on perceived ease of use of IoTs

S/N	Perceived Usefulness by Institution	College of Education (n = 13)			Polytechnic (n = 55)			Technical College (n = 32)			University (n = 41)			Other (n = 8)		
		M	SD	RMK	M	SD	RMK	M	SD	RMK	M	SD	RMK	M	SD	RMK
1	Learning to use IoTs tools is easy for me.	4.08	0.64	Agree	4.02	0.83	Agree	4.09	0.78	Agree	3.93	0.82	Agree	3.38	0.74	Agree
2	It is easy for me to operate IoTs tools.	4.00	0.71	Agree	4.13	0.77	Agree	3.84	0.92	Agree	3.85	0.79	Agree	3.63	0.52	Agree
3	It is easy for me to integrate IoT into my teaching.	3.92	0.64	Agree	4.00	0.88	Agree	4.00	0.88	Agree	3.90	0.80	Agree	4.00	0.76	Agree
4	Using IoTs will not require much effort from me.	4.15	0.80	Agree	3.87	0.92	Agree	3.88	0.91	Agree	3.85	0.91	Agree	3.25	0.89	Agree
	Gender	4.04	0.58	Agree	4.00	0.75	Agree	3.95	0.73	Agree	3.88	0.71	Agree	3.56	0.55	Agree

Field Data, 2026

The result in Table 4 shows grand means of 4.04, 4.00, 3.95, 3.88 and 3.56 for respondents from colleges of education, polytechnics, technical colleges, universities and others respectively. The result shows that there is similarity in the responses of TVET teachers and TVET teacher educators from these different institutions regarding the ease of use of IoTs as instructional tool. The result Table 6 shows F (4, 144) = 0.801, p = 0.526 > 0.05. This is an indication that there is no significant difference in the perceived ease of use of IoTs as instructional tools based on institutional type among TVET teachers and TVET teacher educators in Rivers and Bayelsa States.

Table 6: ANOVA for influence of institutional type on perceived ease of use of IoTs

Sources	Sum of Squares	df	Mean Square	F	p-value	Decision
Between Groups	1.629	4	0.407	0.801	0.526	Fail to Reject
Within Groups	73.203	144	0.508			
Total	74.831	148				

Field Data, 2026

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Research Question 5: Is there a significant difference in the perceived usefulness of IoTs as instructional tool based on location among TVET teachers and TVET teacher educators in Rivers and Bayelsa States?

Table 7: Mean for influence of location on perceived usefulness of IoTs

S/N	Perceived Usefulness	Bayelsa (n = 55)			Rivers (n = 94)			
		M	SD	RMK	M	SD	RMK	t-test
1	Using IoTs will improve my instructional effectiveness.	4.55	0.69	Agree	4.61	0.64	Agree	t = 0.367
2	IoTs will enhance students' learning outcomes.	4.47	0.63	Agree	4.57	0.61	Agree	p = 0.714
3	IoTs will make teaching more efficient.	4.47	0.63	Agree	4.50	0.70	Agree	df = 147
4	IoTs is useful for practical training programme like TVET.	4.29	0.71	Agree	4.24	0.83	Agree	Decision = fail to reject
	Grand Mean	4.45	0.58	Agree	4.48	0.58	Agree	

Field Data, 2026

The result in Table 7 shows grand means of 4.45 for respondents from Bayelsa State and 4.48 for respondents from Rivers State. The result shows that both groups of TVET teachers and TVET teacher educators have positive perception of the usefulness of IoTs as instructional tool. This suggests that there is similarity in their views. The result also shows t (df = 147) = 0.025, p = 0.980 > 0.05. This is an indication that there is no significant difference in the perceived ease of use of IoTs as instructional tool based on location among TVET teachers and TVET teacher educators in Rivers and Bayelsa States.

Research Question 6: Is there a significant difference in the perceived ease of use of IoTs as instructional tool based on location among TVET teachers and TVET teacher educators in Rivers and Bayelsa States?

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Table 8: Mean for influence of location on perceived ease of use of IoTs

S/N	Perceived Eaxe of Use by Location	Bayelsa (n = 55)			Rivers (n = 94)			
		M	SD	RMK	M	SD	RMK	t-test
1	Learning to use IoTs tools is easy for me.	4.00	0.79	Agree	3.97	0.81	Agree	t = 0.912
2	It is easy for me to operate IoTs tools.	4.13	0.72	Agree	3.85	0.83	Agree	p = 0.363
3	It is easy for me to integrate IoT into my teaching.	4.05	0.73	Agree	3.91	0.88	Agree	df = 147
4	Using IoTs will not require much effort from me.	3.85	0.87	Agree	3.86	0.93	Agree	Decision = fail to reject
	Grand Mean	4.01	0.65	Agree	3.90	0.74	Agree	

Field Data, 2026

The result in Table 8 shows grand means of 4.01 for respondents from Bayelsa State and 3.90 for respondents from Rivers State. The result shows that both groups of TVET teachers and TVET teacher educators have positive perception of the ease of use of IoTs as instructional tool. This suggests that there is similarity in their views. The result also shows t (df = 147) = 0.025, p = 0.980 > 0.05. This is an indication that there is no significant difference in the perceived ease of use of IoTs as instructional tool based on location among TVET teachers and TVET teacher educators in Rivers and Bayelsa States.

Discussion of Findings

The result of the study revealed that there was no significant difference in the perceived usefulness of IoTs as instructional tool based on gender among TVET teachers and TVET teacher educators in Rivers and Bayelsa States. This implies that both male and female TVET educators had similar perception regarding the usefulness of IoTs as instructional tool in TVET. Similarly, there was no significant difference in the perceived ease of use of IoTs as instructional tools based on gender among TVET teachers and TVET teacher educators in Rivers and Bayelsa States. This suggests that perceived ease of use did not vary significantly between male and

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female TVET educators in the study area. This result corroborates the result by Lokpo and Kumah (2023) who found that there was no gender difference in the perception of ICT integration in instructional delivery in volta region of Ghana. The result however varies from that of Tun et al. (2021) who reported that gender had significant influence on perception of Industry 4.0 among TVET teachers in Myanmar.

Similarly, the result of the study showed that there was no significant difference in the perceived usefulness of IoTs as instructional tool based on institutional type among TVET teachers and TVET teacher educators in Rivers and Bayelsa States. This implies that TVET educators from college of education, polytechnics, technical colleges, universities and others had similar perception regarding the usefulness of IoTs as instructional tool in TVET. Similarly, there was no significant difference in the perceived ease of use of IoTs as instructional tool based on institutional type among TVET teachers and TVET teacher educators in Rivers and Bayelsa States. This suggests that perceived ease of use did not vary significantly across the institutional types involved in the study. This result negates the result by Tun et al. (2021) who found that type of school had significant influence on perception of Industry 4.0 among TVET teachers in Myanmar.

The study further revealed that there was no significant difference in the perceived usefulness of IoTs as instructional tool based on state (geographical location of the institution) among TVET teachers and TVET teacher educators in Rivers and Bayelsa States. This implies that TVET educators from Bayelsa State and Rivers State had similar perception regarding the usefulness of IoTs as instructional tool in TVET. Similarly, there was no significant difference in the perceived ease of use of IoTs as instructional tool based on institutional type among TVET teachers and TVET teacher educators in Rivers and Bayelsa States. This suggests that perceived ease of use did not vary significantly TVET educators from Bayelsa and Rivers State. This result negates the result by Akuegwu et al. (2011) who found difference in the utilization of Information and Communication Technology (ICT) between teachers from Cross Rivers and Akwa Ibom States. The difference in the variables of study could have accounted for the difference in findings. While the study by Akuegwu et al. (2011) focused on utilization of ICT, the present study focuses on perceived usefulness and ease of use of IoTs.

Conclusions

The study investigated gender, institutional and location difference in the perceived usefulness and ease of use of Internet of Things as instructional tool among TVET educators in Rivers and Bayelsa States. The result showed that there was no significant difference in the perceived usefulness and ease of use of IoTs as instructional tool based on gender, institutional type and location among TVET educators in Rivers and Bayelsa States. This suggests that these demographic factors are not barriers to IoTs acceptance among TVET educators in Rivers and Bayelsa States. This means that

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whatever resistance to IoTs adoption is unlikely to be from who the educators are or where they teach. Consequently, policymakers and institutional administrators can design capacity building programmes for IoTs uniformly, without needing to tailor separate interventions by gender, institution type, or location. Based on this, other factors not examined in this study such as infrastructure availability, technical skills, institutional support or exposure to IoTs tools could be investigated in future studies to examine their influence on perceived usefulness and ease of use of IoTs among these study participants.

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