International Journal of Educational Researchers
16(1): 15-29
ISSN: 1308-9501, Copyright © 2025
DOI: https://doi.org/10.29329/ijer.2025.1295.2

ORIGINAL ARTICLE

University-Industry Partnership Modes of Human Resource Sharing for Electrical/Electronics Technology Education Programme in Northern Nigeria

Aniekan Elijah Asukwo, Hassan Bello, Ahmad Aliyu Deba & Audu Mark Mshelia

[1] Modibbo Adama University, YolaElectrical Technology Education
ORCID: 0000-0002-9384-0206

[2] Abubakar Tafawa Balewa University, BauchiDepartment of Vocational and Technology Education

[3] Abubakar Tafawa Balewa University, BauchiDepartment of Vocational and Technology Education
ORCID: 0000-0002-1684-7885

[4] Abubakar Tafawa Balewa University, BauchiDepartment of Vocational and Technology Education

Ethical Statement
The researchers sought the consent of the respondents before their participation in the study. The respondents were also assured that all information provided will be treated as confidential and used solely for the purpose of the study.

Funding Information
The researchers appreciate the support of the management of Modibbo Adama University, Yola, and the Tertiary Education Trust Fund (TETFund) for the sponsorship offered throughout the period of this study.

Conflict of Interest
No conflict of interest is present in the conduction or the reporting of this study.

ABSTRACT

This study sought to ascertain the different modes in which Electrical/Electronics technology education programme of universities in Northern Nigeria can partner with existing industries within its location in human resource sharing. A mixed method research (MMR) design was adopted for the study. The population of the study consisted 101 respondents comprising lecturers of Electrical/Electronics Technology Education programme in nine universities in Northern Nigeria and industry professionals in the field of Electrical/Electronics technology in the study area. The sample of the study comprised the entire population of the study as the population was small and manageable. A University-Industry Partnership Interview Guide (UIPIG) and University-Industry Partnership Questionnaire (UIPQ) were used for qualitative and quantitative data collection respectively. The reliability of the UIPIG and UIPQ was established through Member Checking and Cronbach Alpha respectively. Thematic analysis was used to answer the research question qualitatively, mean statistic and standard deviation was used to answer the research question quantitatively, while t-test statistics was used to test the null hypothesis at 0.05 level of significance. Qualitative data was obtained from 10 interview participants while quantitative data was obtained from 38 lecturers and 43 industry professionals, totalling 81 respondents from whom questionnaire was retrieved. Findings of the study revealed that industries are ready to collaborate with Electrical/Electronics Technology Education programme in human resource sharing through collaborative teaching, engagement of industry experts, industrial sabbatical of lecturers, and industry secondments of lecturers. It was recommended that university managements should create partnerships between their EETE programme and the industries in their locality, to facilitate knowledge exchange through collaborative teaching initiatives.

Keywords: University-Industry Partnership, Human Resource Sharing, Electrical/Electronics Technology Education Programme

Received: 01/09/2024 **Accepted**: 11/02/2025

*Corresponding Author

Email:

INTRODUCTION

University-industry partnership is a two-way interaction between universities and industries that is formed to facilitate the spread of ideas, people, skills, and innovation with the long-term goal of generating mutual value (Chedid, 2021). According to Gento, Pimente, and Pascual (2022), a university-industry partnership is a relationship that aims to facilitate the exchange of technology and knowledge between institutions and industry. The authors went on to say that while university-industry partnerships can take many different forms, speeches and conferences, student internships, and collaboration and research agreements are the most significant ones. Furthermore, Baporikar (2020) deduced that a university-industry partnership encompasses any form of collaboration between academic institutions and corporations with the aim of collaboratively creating novel products or services or enhancing pre-existing ones. These kinds of cooperation include working together to identify the training needs for programmes, providing financing for training, developing and reviewing curricula, involving industry experts in the classroom, arranging student internships, and exposing teachers to the industry (Nkondola et al., 2019).

If Electrical/Electronics Technology Education (EETE) programme in universities are to get greater results from a partnership with the industry, the area of human resource sharing should be looked into. Human resources are the people who work for an organisation. The phrase "human resources" (HR) refers to the individuals who work for a company or industry, according to Betterteam (2022). According to Heathfield (2021), a human resource is an individual within an industry's workforce who contributes their skills and abilities to the organization's success. Furthermore, according to Heathfield, a human resource is any individual who is prepared to exchange labour, expertise, or time for payment in order to advance the organization—regardless of whether they work full-time, part-time, freelance, or under contract.

According to Albats et al. (2020), human resources are essential to the effective operation of university-industry partnerships because the usefulness and calibre of cooperation heavily rely on the resources that the parties have at their disposal. Highly qualified human resources are essential for a successful partnership, according to Myoken (2013). Merritt (2015) contends that because larger industries have greater human capital, they can use information produced and pushed by universities more effectively than smaller industries. Smaller industries typically lack the trained technicians and engineers that are essential for innovation initiatives, therefore they are less able to absorb the aforementioned information.

Staff mobility and cooperative participation by employees from academia and industry in the dissemination of creativity, ideas, and skills are examples of human resource sharing between the two sectors, with the ultimate goal being the long-term creation of mutual benefit. Human resource sharing and training can include cooperative curriculum development, industry-trained employees, internships, postgraduate training in industry, university faculty and research staff seconded to industry, and adjunct faculty from industry (Guimon, 2013; Bermejo et al., 2022). Many universities have recognised staff mobility as a means of enhancing knowledge transfer between academia and the surrounding society (Fagrell, Geschwind, & Jörnesten, 2016), and they have devised strategies addressing the ways in which this kind of cooperation and collaboration could strengthen their institutions. Furthermore, the authors contend that discussions of human mobility and knowledge transfer frequently come from the perspective of universities, presuming that all knowledge is "produced" there and must be disseminated to society. Additionally, there is technology interchange, which is a process that involves multiple parties including academic institutions, corporate engineers, investors, patent attorneys, and so on.

Adjunct Faculty of Industry Experts

According to Magda, Poulin, and Clinefelter (2015), adjunct faculty refers to academic appointees in university education who are employed part-time and are not on the tenure track. When a faculty member is needed but the university does not want to employ a permanent replacement, adjunct lecturers step in. In addition to facilitating student learning and collaborating with other staff members, such as assistant lecturers and professors, adjunct instructors also prepare lectures and discussion topics for classes, deliver lessons, provide tests, and administer exams (Indeed, 2021; Hering, 2022). The majority of undergraduate teaching can be done by adjuncts, freeing up the other professors to work on graduate and upper-division courses and do research (Hamilton, 2021). One way of providing industry exposure to undergraduates through the human resource sharing of university-industry partnership framework is by employing industry experts as adjunct faculty/classroom instructors.

One unique kind of adjunct instructor is the adjunct faculty of industry specialists, who teach a course while continuing to work in their field full-time outside of academia (Walker & Boyer 2020; Walker, Guido, & Boyer, 2021). According to Boyer and Walker (2020), the realities of contemporary higher education make the use of adjunct lecturers to teach courses a prevalent practice that is frequently seen via institutional restrictions. The goal of the courses created and instructed by adjunct faculty members from industry is to assist students in bridging the divide between intellectualism and pragmatism, theory and practice, and the classroom and the workplace.

In addition to being technical specialists in their domains, adjunct faculty members of industry experts also introduce best practices and innovative problem-solving from an industrial setting into the classroom (Walker & Boyer, 2020). According to Gasper and Lipinski (2016), industry professionals who serve as adjunct faculty members can offer a plethora of industry knowledge and expertise to the classroom, helping to better prepare students for the working world in their respective fields. Walker and Boyer (2020) support this by stating that adjunct industry experts spend time in the workplace and in the classroom every week, which has an impact on the course material because they can offer up-to-date examples and incorporate them into discussions and hands-on activities. The advantage of this, according to Walker and Boyer, is that course content can stay up-to-date and students are exposed to timely industry best practices. This is corroborated by Boyer and Walker (2020) who explain that adjuncts with industry experience can offer a timely perspective on professional job environments, complementing skill sets, and a broader scope of growth and preparedness for students while they pursue their degrees because they are continuously updating and reinforcing their knowledge in the professional context.

Industry Secondment of University Academic Staff

Academic employees are attached to an industry through an arrangement known as "industrial secondment," which gives them a great chance to collaborate on a project with the industry (Chikuku, Chinguwa, & Mushiri, 2017). Another name for it is a temporal arrangement, which allows employees to be released and relocated for a predetermined amount of time without compromising their job status (Department of Public Expenditure and Reform, 2022). According to Renshaw and Holland (2013) and Lincolnshire County Council (2018), the term "secondment" refers to a general temporary transfer or "loan" of an employee to another organisation or to undertake new tasks and responsibilities. The employee usually works closely with the other organisation to provide training, serve as a bridge between the two organisations, and share experiences, but they usually keep their salary and other employment rights from their original organisation.

According to the Department of Public Expenditure and Reform (2022), secondments give employees the chance to grow professionally and personally while still having the option to return to their substantive or equivalent position at the end of the secondment. Additionally, it gives the receiving organisation the chance to fill a temporary post,

and both the sending and receiving organisations gain from the exchange of knowledge, best practices, fresh perspectives, and experience. Similar to this, Moon and Goff-Dupont (2022) clarify that secondments allow workers to work for a different team within their organisation or for a different company entirely. These opportunities improve employee skills, increase engagement, and increase retention for the benefit of individuals, teams, and businesses.

According to Chikuku, Chinguwa, and Mushiri (2017), academic staff members can improve the calibre and applicability of their teaching by participating in research projects that further advance knowledge transfer between industry and academia. Academic staff members can also benefit from the industrial secondment program, which gives them access to up-to-date knowledge and first-hand experience of contemporary industrial practices. The advantages of industrial secondment are as follows, according to Papazafeiropoulou (2014): it allows academics to build strong connections with the business community, which supports knowledge and technology transfer activities; it encourages cross-curricular activities and the dissemination of contemporary industry practices and technologies within the academic community; and it refreshes academic staff members' understanding of the commercial or research environment, enhancing the industrial context of their teaching. Similarly, Mushiri (2013) listed the advantages of industry-academia industrial secondments as follows: industry collaborating with highly skilled academics on mutually beneficial projects; industry forming connections with academic staff; industry contributing to teaching; academic staff gaining current knowledge and firsthand experience of industry; academic staff enhancing the calibre and industrial relevance of their teaching; academic staff forming long-term connections with the industry; and provision of case study materials and ideas for new modules and projects.

Industrial Sabbatical of University Academic Staff

A sabbatical is an extended leave of absence from a full-time job, engagement, or exchange program that most well-structured organisations offer to their employees at some point during their working lives (Amie-Ogan & Pepple, 2021). Additionally, Amie-Ogan and Pepple (2021) clarify that sabbatical is a program in which faculty members collaborate and share ideas with colleagues at different universities in order to advance their professional development. Furthermore, according to Wilderman (2012), sabbatical leave has been shown to significantly improve teaching efficacy, expand scholarly productivity, fortify academic programs, and foster instructors' feelings of dedication, loyalty, and belonging to their institutions. Most sabbatical leaves involve leaves of absence for an extended visit to another academic institution or a government laboratory with the intent of collaborating with a host researcher or team, to utilize specialized facilities, or perhaps to develop a new research interest (Batson, 2015).

One way to think of sabbatical leave for academic staff members moving from academia to industry is as a type of human resource sharing. According to Batson (2015), assigning tenured faculty members on one- to two-semester sabbatical leaves at an industry site is one way to foster and fortify linkages between universities and industry. This gives the faculty member the chance to work effectively towards their objectives, build rapport with the management and engineers at the host site, gain access to follow-on contracts and publishable outcomes, and promote novel techniques and technologies (Batson, 2015). McFall, Kurmas, Conrad, and Frailey (2019) opines that, carrying out sabbatical in industry helps academics to develop their skills, discover and practice the skills that are currently being used in industry, gain credibility with their students, improve their understanding of their profession, build relationships with local businesses. In Nigeria, sabbatical leaves are granted to professors, readers and senior lecturers after six years of continuous service to the university for 6-12 months (National Universities Commission, 2019).

METHOD

Research Design

The research design for this study was a mixed method research. A mixed method research design involves the collection of both qualitative (open-ended) and quantitative (closed-ended) data in a bid to answer research questions and/or test the null hypotheses. Leavy (2017) opines that mixed method research involves collecting and integrating qualitative and quantitative data in a single project. Creswell and Plano Clark (2018) defined mixed-method designs as those that include at least one qualitative method which is designed to collect words and one quantitative method which is designed to collect numbers. It combines elements of qualitative and quantitative research approaches (e.g., use of qualitative and quantitative viewpoints, data collection, analysis, inference techniques) for purpose of giving a richer and more reliable understanding (broader and deeper) and corroboration of a phenomenon than what would have been obtainable using a single approach.

Cohen, Manion, and Morrison (2018) asserts that mixed method research design enables a more comprehensive and complete understanding of a phenomenon to be obtained than what is obtainable using single methods approaches, and also answers complex research questions more meaningfully. There are three primary types of mixed method research: Sequential, Convergent, and Nested (Leavy, 2017). For the purpose of this study, the researcher adopted the convergent mixed method research design.

Convergent or concurrent designs involve collecting both qualitative and quantitative data, analysing both datasets, and then integrating the two sets of analyses in order to cross-validate or compare the findings (Leavy, 2017). Convergent mixed methods design is also described as a single-phase approach where a researcher collects both qualitative and quantitative data, analyses them separately, and then compares the results to see if the findings confirm or disconfirm each other (Creswell & Creswell, 2018; Saunders, Lewis, & Thornhill, 2019).

Area of the Study

The area of the study was Northern Nigeria. Northern Nigeria is geographically located at latitude 10.51^0 North and longitude 7.43^0 East. It occupies an area of 660,000Km^2 with an estimated population density of 104,458,581 people as at 2017 (National Bureau of Statistics, 2018). Northern Nigeria boasts of several tertiary institutions. Notably amongst the tertiary institutions are nine universities who offer Electrical/Electronics Technology Education programme at undergraduate level. These universities are Abubakar Tafawa Balewa University Bauchi, Modibbo Adama University Yola, Benue State University Makurdi, Taraba State University Jalingo, University of Jos, Bayero University Kano, Aliko Dangote University of Science and Technology Wudil, Yusuf Maitama Sule University Kano and Federal University of Technology Minna (Joint Admissions and Matriculation Board, 2022).

Population of the Study

The population of this study consisted of 101 respondents comprising lecturers of Electrical/Electronics Technology Education programme in nine universities in Northern Nigeria and industry professionals in the field of Electrical/Electronics technology in the study area. Specifically, a total of 50 lecturers of Electrical/Electronics Technology Education programme in nine universities in Northern Nigeria and 51 industry professionals in the field of Electrical/Electronics technology in the states where the universities are situated, was used for the study.

Instrument for Data Collection

The instruments that were used for collecting data for this study was a structured a semi-structured interview guide and a structured questionnaire developed by the researcher for lecturers of Electrical/Electronics Technology Education programme in universities in Northern Nigeria and industry professionals in the field of Electrical/Electronics technology in the states where the universities are situated. The instruments are described as follows:

Instrument for Qualitative Data Collection

The instrument for qualitative data collection was a semi-structured interview guide. The interview guide was titled University-Industry Partnership Interview Guide (UIPIG). The Interview guide was divided into sections A and B. Section A contained essential information of the interviewees, while section B contained open-ended questions that elicited information on different modes of human resource sharing for university-industry partnership in Electrical/Electronics Technology Education programme in Northern Nigeria.

Instrument for Quantitative Data Collection

The instrument for the quantitative data collection was a structured questionnaire. The questionnaire instrument was titled University-Industry Partnership Questionnaire (UIPQ). The questionnaire items comprised of identified modes of human resource sharing for university-industry partnership from literature review. The Questionnaire was divided into sections A and B. Section A contained demographic information of the respondents, while section B elicited responses on different modes of human resource sharing for university-industry partnership in Electrical/Electronics Technology Education programme in Northern Nigeria. The response options of the questionnaire were based on a five-point likert scale and defined as follows:

Very Highly Required	(VHR)	.....	5points
Highly Required	(HR)	.....	4points
Moderately Required	(MR)	.....	3points
Slightly Required	(SR)	.....	2points
Very Slightly Required	(VSR)	.....	1point

Reliability of the Instrument

The reliability of the research instruments was ascertained from data collected during the pilot studies as follows:

Reliability of the Interview Guide

The reliability of the interview guide was ascertained by administering the interview to 5 respondents (3 lecturers and 2 industry professionals) in Southern Nigeria. The choice of Southern Nigeria is because it is not part of the sample, neither does it constitute part of the study's population, but shares similar characteristics with the population of the study as Electrical/Electronics technology education programme is regulated by the same body [National Universities Commission (NUC)] throughout the country. Interview participants were identified by using first letters from the nomenclature of their work; where PL represented a participant lecturing in Electrical/Electronics Technology Education programme and PS represented an industry professional in the area of Electrical/Electronics Technology. The composition of interviewees involved a past dean (PL1), two past heads of department (PL2 and PL3), an electrical power generation technician (PS1), and a telecommunication site supervisor (PS2).

Members Checking session was then employed to establish the reliability of the interview instrument (Creswell & Creswell, 2018; Cohen, Manion, & Morrison, 2018; Creswell & Plano Clark, 2018; Saunders, Lewis, & Thornhill, 2019). This involved taking the transcribed information back to the participants to allow them confirm its accuracy and correct

errors. There was no objection made by the interview participants during the member checking session, hence, the interview instrument was adjudged reliable and acceptable for full scale study.

Reliability of the Questionnaire

The internal consistency of the questionnaire was ascertained by administering the questionnaire to 26 respondents (13 lecturers and 13 industry professionals) in Southern Nigeria. The choice of Southern Nigeria is because it is not part of the sample, neither does it constitute part of the study's population, but shares similar characteristics with the population of the study as Electrical/Electronics technology education programme is regulated by the same body [National Universities Commission (NUC)] throughout the country. The data generated was used to determine the reliability index of the questionnaire. The internal consistency of the instrument was determined using Cronbach's Alpha technique. The Cronbach's Alpha coefficient for the University-Industry Partnership Questionnaire (UIPQ) was 0.795 which indicates a high level of internal consistency reliability. George and Mallery (2019) indicates that a reliability coefficient of 0.70 and above signifies an acceptable coefficient for the internal consistency; hence, with a reliability coefficient of 0.795, the questionnaire was adjudged consistent and acceptable for full scale study.

Method of Data Collection

The researcher obtained permission from the universities and the industries selected for the study before proceeding to administer the research instruments to the two categories of respondents (lecturers and industry professionals). Data collection for qualitative and quantitative aspects of the study were carried out concurrently as follows:

Method of Qualitative Data Collection

For the qualitative data collection, the researcher interacted with the 10 respondents (lecturers and industry professionals) using a semi-structured interview guide. Several researches have shown that it requires from 5 to 30 interviews to reach saturation in interviews (Marshall, Cardon, Poddar, & Fontenot, 2013; Boddy, 2016; Hennink & Kaiser, 2022). Hence, the use of 10 interviewees is within recommended range.

Interview participants were identified by using first letters from the nomenclature of their work; where UL represented a participant lecturing in Electrical/Electronics Technology Education programme and IP represented an industry professional in the area of Electrical/Electronics Technology. The composition of interviewees involved a past dean (UL1), three past heads of department (UL2, UL3 and UL5), a current serving head of department (UL4), an electrical power generation technician (IP1), a regional operations coordinator (IP2), a managing director (IP3), a human resource manager (IP4), and a regional manager (IP5).

The semi-structured interview guide contained open-ended questions that was asked during the interview. The interview was recorded with the aid of an audio device. The audio recording of the interview was later transcribed for analysis and interpretation. Additionally, the researcher provided a template for recording information gathered during the interview and the essential data about the time, day, and place of interview. This becomes a backup system in the event that the recording device fails.

Method of Quantitative Data Collection

For the quantitative data collection, the researcher administered 101 copies of the questionnaire on the lecturers and industry professionals during official work hours. The essence of administering the questionnaire during official work hours is to enable the researcher have access to about 100% of the study population. Completed copies of the questionnaire were retrieved at the convenience of the respondents. This was to give the respondents ample time to respond to the questionnaire items objectively. Out of the 101 copies of the questionnaire administered, 81 copies were

successfully completed and retrieved. This figure represents 80.12% response rate, and was considered excellent.

Method of Data Analysis

The qualitative data that was collected for this study was analysed using NVivo version 14 while the quantitative data that was collected for this study was analysed using Statistical Package for Social Sciences (SPSS) version 27.0. The statistical methods and techniques employed are described as follows:

Method of Qualitative Data Analysis

Qualitatively, the research questions were answered using thematic analysis; reading the transcripts from the transcribed audio data and labelling relevant pieces (coding). The coding enabled the researcher to identify similar information. The researcher then decided which codes are the most important, and creating categories by bringing several codes together, labelling categories and deciding which are the most relevant and how they are connected to each other, deciding if there is a hierarchy among the categories, writing up the results, and then summarized the results. The entire process of organizing and analysing the qualitative data collected was done with the aid of NVivo version 14. Results of the qualitative data was then merged with results from the quantitative data.

Method of Quantitative Data Analysis

Quantitatively, the research questions were answered using the mean ($\bar{x}$) statistic and standard deviation (σ), while the null hypotheses were tested using independent t-test statistic at 0.05 level of significance. Before carrying out the data analysis, the data was subjected to data cleaning in order to ascertain if there are missing variables, out-of-the-range values, and/or outliers. This was necessary because data that is incorrect, missing, irrelevant, duplicated, or improperly formatted may hinder the process or provide inaccurate results.

In answering the research questions, a mean criterion of 3.50, which corresponds to the lower limit of 4-point on a 5-point Likert-scale, was adopted (Moses et al., 2021; Mbaga, Yusuf, & Asukwo, 2022). This meant that an item with a mean rating of 3.50 and above was considered as Highly Required (HR) while an item with a mean rating less than 3.50 (3.49 and below) was considered as Slightly Required (SR). In interpreting the result of the t-test analysis as was contained in the SPSS output, where the *p*-value is greater than .05 ($p > .05$), the null hypothesis was accepted and where *p*-value is less than or equal to .05 ($p \leq .05$), the null hypothesis was rejected.

RESULTS AND DISCUSSION

Qualitative Data Analysis

Research Question: What are the Required Modes of Human Resource Sharing for University-Industry Partnership in Electrical/Electronics Technology Education Programme in Northern Nigeria?

In order to obtain feedback from the interviewees regarding the required forms of partnership, the following format for the interview research question was planned: "*How can the universities partner with industries for human resource sharing in Electrical/Electronics Technology Education programme in Northern Nigeria"?* Using thematic analysis, the interviewees' comments were categorised into sub-themes of human resource sharing and the results are shown in Table 1.

Table 1. Qualitative Results of Partnership in Human Resource Sharing

S/N	Interviewee	Quote	Sub-theme(s)
1.	UL1:	*These two approaches are very important to the field of technical education. Lecturers go out to gain experience, while the industries come to give the students the experience of the world of work, which cannot be gotten within the four walls of the classroom. It works well that way.*	Engagement of Industry Experts, Industrial Sabbaticals, Industrial Secondments
2.	UL2:	*Lecturers should be able to go to the industries and learn new technology while the industry staff should be able to come to classroom and give the students their work experience.* *Staff from the industries can be attached to lecturers taking specific courses to co-teach the course, thus bringing the wealth of industry knowledge to classroom.*	Collaborative Teaching, Engagement of Industry Experts, Industrial Sabbaticals, Industrial Secondments
3.	IP1:	*If requested for, our company can always send a staff to the department to help out with practical aspects of the programme.*	Collaborative Teaching, Engagement of Industry Experts
4.	IP2:	*……there is no problem with lecturers coming here for a short period of time, or our staff going to help out in the electrical/electronics technology in any way we can.*	Collaborative Teaching, Engagement of Industry Experts, Industrial Sabbaticals
5.	IP3:	*……we are open to any collaboration with any institution or Research Centre that will help develop our society.*	Engagement of Industry Experts, Industrial Sabbaticals
6.	IP4:	*We can allow our experts to provide expertise to your programme.* *For us, we accept contract staff, so I can consider that an avenue of resource sharing that can be explored.*	Engagement of Industry Experts, Industrial Sabbaticals
7.	UL3:	*You see, this also has to do with all areas. Because, in terms of maybe collaborative teaching, you can invite industry experts or professionals to come and collaborate or partner with academic staff to teach a particular concept.* *And also, the issue of sabbatical or leave, an academic staff can go to the industries on leave for six months or one year depending on their institution's policy, as well as technologists should also be given that opportunity to go to the industry and perform their leave (either sabbatical or operational, whatever type of leave).*	Collaborative Teaching, Engagement of Industry Experts, Industrial Sabbaticals
8.	IP5:	*We welcome a collaboration in the area of staff exchange. We will accept your people to come here and share knowledge with us, likewise we will not hesitate to send our experts to your institution to exchange knowledge.* *Our expert can go to your place and give lectures, even if it is part-time.*	Collaborative Teaching, Engagement of Industry Experts, Industrial Sabbaticals
9.	UL4:	*There should be a way of inviting industry professionals to come to universities to handle some practicals; they can also collaborate with the technologists in our labs so that what is taught is what the industry needs.* *The lecturers should be able to go industries to acquire knowledge on some practical aspect or technology.*	Collaborative Teaching, Engagement of Industry Experts, Industrial Sabbaticals
10.	UL5:	*Lecturers can be sent to companies, and industry personnel can be brought as guest lecturers to teach practical courses.* *Lecturers can also consider applying to industries for sabbatical as against the usual sabbatical to sister-universities.*	Collaborative Teaching, Engagement of Industry Experts, Industrial Sabbaticals, Industrial Secondments

Key: UL = University Lecturer, IP = Industry Professional

Table 1 shows that the thematic analysis of interviews carried out revealed four sub-themes as the required modes of human resource sharing for university-industry partnership in Electrical/Electronics Technology Education programme in Northern Nigeria. The result highlights that the interviewees have recommended that a partnership that involves collaborative teaching, engagement of industry experts, industrial sabbatical of lecturers, and industry secondments of lecturers, are the required modes of university-industry partnership for human resource sharing in Electrical/Electronics Technology Education programme in Northern Nigeria. Both sides express openness to these collaborations, recognizing their potential to enhance education and better prepare students for the workforce.

UL1 who is a past Dean commented that "*Learning is a lifelong process; it does not stop. Research into the field of technology is growing very fast. It is therefore pertinent for the lecturers to go out to where these technologies are put into practice and learn how these things work out there. That experience is very very vital, because lecturers often dwell on the*

theories without taking into consideration the impact that practical approach will create. But by taking lecturers out to go and experience the world of work, and taking staff from the industries to come into the classroom, they are coming with the real-world experience into the classroom. These two approaches are very important to the field of technical education. Lecturers go out to gain experience, while the industries come to give the students the experience of the world of work, which cannot be gotten within the four walls of the classroom". Similarly, IP5 who is a regional manager opined that "*We will accept your people to come here and share knowledge with us, likewise we will not hesitate to send our experts to your institution to exchange knowledge. Our expert can go to your place and give lectures, even if it is part-time. If we need some information or assistance or help, we will invite you people to come here and lecture our staff technically and otherwise. It is a welcomed idea because we have the practical knowledge, and you have the theoretical knowledge. So, if we collaborate together, you will see that we marry the technology or practical aspect to the theoretical aspect, then we move ahead*".

Quantitative Data Analysis

Research Question: What are the Required Modes of Human Resource Sharing for University-Industry Partnership in Electrical/Electronics Technology Education Programme in Northern Nigeria?

Table 2. Mean and Standard Deviation of Responses on the Required Modes of Human Resource Sharing for University-Industry Partnership

S/N	Modes	Respondents $n_L = 38, n_P = 43, n_T = 81$						Remarks
		$\bar{x}_L$	σ_L	$\bar{x}_P$	σ_P	$\bar{x}_T$	σ_T	
1.	Engagement of industry experts to teach in EETE programme on a part-time basis	4.26	0.64	4.05	0.62	4.15	0.63	HR
2.	Engagement of industry experts to teach in EETE programme on a full-time basis	3.18	1.06	3.16	1.17	3.17	1.12	SR
3.	Secondment of EETE academic staff to industries on a part-time basis	4.24	0.82	3.58	1.20	3.89	1.08	HR
4.	Secondment of EETE academic staff to industries on a full-time basis	3.11	1.11	2.53	1.05	2.80	1.11	SR
5.	Industrial sabbatical of EETE academic staff in industries	4.21	0.70	3.26	1.16	3.70	1.08	HR
	Grand Mean					**3.54**	**1.00**	**HR**

Key: HR = Highly Required, SR = Slightly Required, $\bar{x}_L$ = Mean of University Lecturers, $\bar{x}_P$ = Mean of Industry Professionals, $\bar{x}_T$ = Item Mean of Means, σ_L = Standard Deviation of University Lecturers, σ_P = Standard Deviation of Industry Professionals, σ_T = Item Mean of Standard Deviations, n_L = number of University Lecturers, n_P = number of Industry Professionals, n_T = Total Respondents.

The result of quantitative analysis as presented on Table 2 indicates that, based on the mean benchmark of 3.50, both respondents (University Lecturers and Industry Professionals) favour a partnership in human resource sharing that will involve engagement of industry experts to teach in EETE programme on a part-time basis, secondment of EETE academic staff to industries on a part-time basis, and industrial sabbatical of EETE academic staff in industries, with mean values of 4.15, 3.89, and 3.70 respectively. Additionally, with a standard deviation ranging from 0.63 to 1.12, there is uniformity in the responses of the respondents.

Research Hypothesis

H_o: There is no significant difference between the mean responses of lecturers and industry professionals on the required modes of human resource sharing for university-industry partnership in Electrical/Electronics Technology Education programme in Northern Nigeria.

Table 3. Independent Sample t-test analysis of responses on the required modes of human resource sharing for university-industry partnership

	$\bar{x}$	σ	n	df	α	t_{cal}	*p*	Decision
University Lecturers	3.80	0.55	38	79	0.05	3.845	0.001	H_0 Rejected
Industry Professionals	3.31	0.57	43					

KEY: $\bar{x}$ = Mean, σ = Standard Deviation, n = Number of Respondents, df = Degree of Freedom, α = level of significance, t_{cal} = Calculated t-value, *p* = Significance (2-tailed)

The result on Table 3 reveals a t_{cal} of 3.845 with a *p*-value of 0.001. Since the *p*-value is less than the alpha level of the test ($p<.05$), the null hypothesis tested is rejected. This means that there is a significant difference between the mean responses of lecturers and industry professionals on the required modes of human resource sharing for university-industry partnership in Electrical/Electronics Technology Education programme in Northern Nigeria.

Discussion of the Findings

The qualitative and quantitative data analysed in line with the purpose of the study shows that industries are ready to collaborate with electrical/electronics technology education programme in human resource sharing through collaborative teaching, engagement of industry experts, industrial sabbatical of lecturers, and industry secondments of lecturers. These findings are in line with the study by Obwoge, Mwangi, and Nyongesa (2013) who established staff exchange as a form of partnership between TVET institutions and industries. Similarly, Boyer and Walker (2020) established that there is an impact of industry expert adjuncts on students' course experiences. Boyer and Walker (2020) also revealed that, similar to the hard skills that students had shared, their experiences learning these skills were impacted by the current work experience of the instructor outside of the institution. Furthermore, Albats, Bogers, and Podmetina (2020) and Amie-Ogan and Pepple (2021) reveal that human capital components are required to activate the drivers of university partnerships. Walker and Boyer (2020) found that bridging the gap between thinking and doing requires using industry expert adjuncts.

The test of hypothesis relating to the purpose of the study indicates that there is a significant difference between the mean responses of lecturers and industry professionals on the required modes of university-industry partnership for human resource sharing in Electrical/Electronics Technology Education programme in Northern Nigeria. This difference could be as a result of difference in expectations and priorities, leading to varying opinions on how best to structure and implement human resource sharing between universities and industries. Lecturers' focus may be more on academic knowledge transfer and long-term educational goals, while industry professionals might emphasize immediate practical applications, skill acquisition, and addressing current industry demands.

CONCLUSION AND RECOMMENDATIONS

The findings from both qualitative and quantitative data indicate a strong willingness from industries to collaborate with Electrical/Electronics Technology Education (EETE) programmes across different modes for human resource sharing. Industries are prepared to actively engage in human resource sharing, offering expertise and collaborative teaching to enhance educational outcomes. It is therefore recommended that university managements should create partnerships between their EETE programme and the industries in their locality, to facilitate knowledge exchange through collaborative teaching initiatives. Formal agreements can outline the terms of engagement and ensure mutual benefits for both parties,

enhancing the educational experience and keeping lecturers updated on industry practices. It is also recommended that further research be carried out on integration of university-industry partnerships into EETE programmes and industrial landscapes of Northern Nigeria.

Acknowledgments

The researchers wish to also extend their gratitude to all Directors/Managers of various industries, and Heads of Department and staff members of the EETE programmes in the institutions this research was conducted. Special thanks to Prof. T. M. Saba (Department of Industrial and Technology Education, Federal University of Technology, Minna), Mrs. Frank Patience Olivia (Department of Science and Technical Education, Taraba State University, Jalingo), Mr. Kabiru Bawa (Department of Technology Education, Yusuf Maitama Sule University, Kano), and Mr. Nasiru Sani Zakirai (Department of Technical and Vocational Education, Aliko Dangote University of Science and Technology, Wudil) for their various roles in facilitation of data collection for this study.

REFERENCES

Albats, E., Bogers, M., & Podmetina, D. (2020). Companies' human capital for university partnerships: A micro-foundational perspective. *Technological Forecasting and Social Change*, *157*, 1 – 15.

Amie-Ogan, T. O. & Pepple, E. A. (2021). Human capital development for enhancing academic staff performance in universities in Rivers State. International Journal of Innovative Development and Policy Studies, 9(3), 78 – 89.

Baporikar, N. (2020). *Understanding entrepreneurial university: A framework for emerging economies.* USA: IGI Global.

Batson, R. G. (2015). Sabbatical leaves with industry–Three experiences. 122nd ASEE Annual Conference and Exposition. June 14 – 17, 2015. Seattle, WA.

Bermejo, M. A. V., Eynian, M., Malmskold, L., & Scotti, A. (2022). University–industry collaboration in curriculum design and delivery: A model and its application in manufacturing engineering courses. *Industry and Higher Education*, *36*(5), 615 – 622.

Betterteam (2022). What is human resources? Retrieved October 15, 2022; from: *https://www.betterteam.com/what-is-human-resources*

Boddy, C. R. (2016). Sample size for qualitative research. *Qualitative Market Research*, *19*(4), 426 – 432.

Boyer, D. M., & Walker, E. B. (2020). The impact of industry expert adjuncts on students' course experiences. *International Journal of Innovative Teaching and Learning in Higher Education (IJITLHE)*, *1*(2), 16 – 28.

Chedid, M. (2021). *Knowledge management in university-software industry collaboration.* USA: IGI Global.

Chikuku, T., Chinguwa, S., & Mushiri, T. (2017). Industrial secondment as a tool to enrich engineering education in Southern Africa. *Procedia Manufacturing*, *7*, 15 – 21.

Cohen, L., Manion, L., & Morrison, K. (2018). *Research methods in education* (8th ed.). New York: Routledge, Taylor & Francis.

Creswell, J. W. & Creswell, J. D. (2018). *Research designs: Qualitative, quantitative, and mixed methods approaches* (5th ed.). Thousand Oaks, California: SAGE Publications

Creswell, J. W. & Plano Clark, V. L. (2018). *Designing and conducting mixed methods research* (3rd ed.). Thousand Oaks, California: SAGE Publications

Department of Public Expenditure and Reform (2022). Secondment. Retrieved March 30, 2022; from: https://hr.per.gov.ie/en/corporate-pages/career/mobility/secondment/

Fagrell, P., Geschwind, L., & Jörnesten, A. (2016). Industrial adjunct professors in Sweden: meeting many goals despite unexpressed expectations. *Nordic Journal of Studies in Educational Policy*, 2016 (2-3), 31 – 47.

Gasper, C., & Lipinski, J. (2016). Industry experience: Enhancing a professor's ability to effectively teach in higher education. The Journal of Humanistic Education and Development, 5(3), 63–67.

Gento, A. M., Pimente C., & Pascual, J. A. (2022). *Teaching circular economy and lean management in a learning factory.* USA: IGI Global.

George, D. & Mallery, P. (2019). *SPSS for windows step by step: A simple guide and reference* (16th ed). New York: Routledge, Taylor & Francis.

Guimon, J. (2013). *Promoting university-industry collaboration in developing countries*. Innovation Policy Platform, OECD and World Bank. 10.13140/RG.2.1.5176.8488.

Hamilton, D. (2021). Adjunct advantages: The future of education. Retrieved March 30, 2022; from: https://drdianehamilton.com/adjunct-advantages-the-future-of-education/

Heathfield, S. M. (2021). What is a human resource? Retrieved March 15, 2022; from: *https://www.thebalancemoney.com/what-is-a-human-resource-1918144*

Hennink, M., & Kaiser, B. N. (2022). Sample sizes for saturation in qualitative research: A systematic review of empirical tests. Social Science & Medicine, 292, 114523.

Hering, B. B. (2022). What Is an adjunct professor? Job description, skills and more. Retrieved October 30, 2022; from: https://www.flexjobs.com/blog/post/what-is-an-adjunct-faculty-job/

Indeed (2021). What does an adjunct instructor do? Retrieved March 30, 2022; from: https://www.indeed.com/career/adjunct-instructor

Joint Admissions and Matriculation Board (2022). *Guidelines for admissions to first degree, National Diploma (ND), National Innovation Diploma (NID) and Nigeria Certificate in Education (NCE) programmes in universities, other degree-awarding institutions, monotechnics, polytechnics, innovation enterprise institutions and colleges of education in Nigeria; 2022 brochure*. Garki, Abuja: JAMB

Leavy, P. (2017). *Research design: Qualitative, quantitative, mixed methods, arts-based, and community-based participatory research approaches*. New York: The Guilford Press

Lincolnshire County Council (2018). Employment manual: Secondment procedure. Retrieved September 30, 2022; from: https://professionals.lincolnshire.gov.uk/downloads/file/502/secondment-procedure

Magda, A. J., Poulin, R., & Clinefelter, D. L. (2015). *Recruiting, orienting, and supporting online adjunct faculty: A survey of practices*. The Learning House & WCET. Retrieved March 30, 2022; from: https://wcet.wiche.edu/sites/default/files/OnlineAdjunctFacultySurveyReport.pdf

Marshall, B., Cardon, P., Poddar, A., & Fontenot, R. (2013). Does sample size matter in qualitative research?: A review of qualitative interviews in IS research. *Journal of Computer Information Systems*, *54*(1), 11 – 22.

Mbaga, E. V., Yusuf, M. A., & Asukwo, A. E. (2022). Development and Validation of a Psychomotor Skills Assessment Tool for Electrical Installation and Maintenance Works Trade of Technical Colleges in Nigeria. International Journal of Vocational Studies and Library Science (IJOVALIS), 2(2), 1 – 21.

McFall, R., Kurmas, Z., Conrad, P., & Frailey, D. (2019). *Why and how to spend a sabbatical in industry*. In Proceedings of the 50th ACM Technical Symposium on Computer Science Education (SIGCSE '19). Association for Computing Machinery, New York, NY, USA, 809–810.

Merritt, H. (2015). The role of human capital in university–business cooperation: The case of Mexico. *Journal of the Knowledge Economy*., *6*(3), 568 – 588.

Moon, L. & Goff-Dupont, S. (2022). Secondments: the most powerful job training you've never heard of. Retrieved October 30, 2022; from: https://www.atlassian.com/blog/teamwork/what-is-secondment-benefits

Moses, D., Asukwo, A. E., Yusuf, M. A., & Ibanga, I. J. (2021). Achieving Sustainable Development Goals 2016-2030 in Nigeria through Female Enrolment into Electrical/Electronics Engineering Trade in Technical Colleges of Adamawa State. Journal of Advance Research in Economics and Administrative Sciences, 2(1), 28 – 39.

Mushiri, T. (2013). Royal Academy of Engineering proceedings of the 2013 Research agenda Workshop 19th – 21st November 2013, Chinhoyi University of Technology hotel, Zimbabwe.

Myoken, Y. (2013). The role of geographical proximity in university and industry collaboration: Case study of Japanese companies in the UK. *International Journal of Technology Transfer and Commercialisation (IJTTC)*, *12*(1/2), 30 – 43.

National Bureau of Statistics (2018). Demographics statistics bulletin. Retrieved September 22, 2022; from: https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwiwkefMlqn6AhWysKQKHYAyBD4QFnoECAcQAQ&url=https%3A%2F%2Fnigerianstat.gov.ng%2Fdownload%2F775&usg=AOvVaw1HuYamjCJoZk8geCvTnFYr

National Universities Commission (2019). NUC sends professors, senior lecturers to oil rig, industries for sabbatical leave, NUC Publications.

Nkondola, A., Kumwenda, C., Hilary, I., Millinga, M. & Mwinuka, R. (2019). Partnership between technical institutions and the engineering industry in addressing manpower needs of the labour market in Tanzania. *International Journal of Vocational and Technical Education Research, 5*(5), 24 – 33.

Obwoge, M. E., Mwangi, S. M., & Nyongesa, W. J. (2013). Linking TVET institutions and industry in Kenya: Where are we. *The International Journal of Economy, Management and Social Science, 2*(4), 91 – 96.

Papazafeiropoulou, A. (2014). Industrial fellowship scheme. Retrieved August 10, 2022; from: http://www.thenef.org.uk/product/nef_industrial_fellowship_scheme

Renshaw, P. & Holland, D. (2013). Secondments - A missed opportunity? Retrieved August 10, 2022; from: https://www.researchgate.net/publication/271528198_Secondments_-_A_Missed_Opportunity

Saunders, M. N. K., Lewis, P., & Thornhill, A. (2019). *Research methods for business students*. (8th ed.). Essex: Pearson Education Limited.

Walker, E. & Boyer, M. D. (2020). Bridging the gap between thinking and doing: Industry expert adjuncts and future-ready teaching methods. *ETH Learning and Teaching Journal, 2*(2), 228 – 231.

Walker, E. B., Guido, A., & Boyer, M. (2021). Exploring the impact of the pandemic on the future of industry expert adjuncts. Retrieved March 30, 2022; from: https://www.researchgate.net/publication/350417475_exploring_the_impact_of_the_pandemic_on_the_future_of_industry_expert_adjuncts

Wildman, K. L. (2012). Staff sabbaticals: an examination of sabbatical purposes and benefits for higher education administrators. PhD Thesis, University of Iowa, Iowa City, Illinois.