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RESEARCH ARTICLE

Systematic development of entrepreneurship skills framework for students of electrical technology in Nigeria

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ABSTRACT

The rising rate of youth unemployment and the attendant consequences on the general population in Nigeria called for concern. The academia and other relevant stakeholders have gradually come to realize that the possession of academic qualifications alone cannot guarantee a good quality job. Thus, many of Nigerian higher institutions are now introducing entrepreneurship studies into their school curriculum without a clear framework. This study intends to create a topology of skills that will help Electrical Technology students in Nigeria find jobs. To gather information about the different skills needed, the Google Scholar search engine was adopted. The search was between 2018 and 2023. The inclusion criteria involve entrepreneurship studies with a focus on Technical Education, Vocational education, and Electrical Technology. A total of 80 Journal articles were extracted for the study. Data were directly collected from the critical stakeholders. The study was guided by 3 objectives. The participants for the study involved 12 experts from the industry and academics. The sample size was purposive and obtained based on Theoretical saturation. The topology of skills was achieved with the application of the Nvivo12 software and the thematic analysis. A Broad skill suitable for the 21st-century job matching for electrical technology students was generated. The study is recommended for in-depth analysis in order the isolate all the in fits.

Keywords: unemployment; entrepreneurship; framework; employability; topology of skills

1. Introduction

One of the greatest challenges facing Nigeria in recent times is youth unemployment[1–3]. The alarming rate of unemployment among the students of Electrical Technology who graduated from Colleges of Education particularly sparked the choice of this study. The idea was made due to the growing number of graduate students who roam about the streets and complaining about the lack of jobs. Aminu[4] noted that the skills

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mismatch index for Education and Engineering graduates stood at 0.6264 and 2.4896 respectively. This has contributed largely to the high rate of poverty, inequality and criminality in the country. Though the challenge is global, it is more severe in African countries and Nigeria in particular[3,5]. The amount of money set aside for education has increased greatly since 2011 from millions to billions of naira. This has led to better government involvement in improving facilities and training to help graduates get jobs. The Tertiary Education Trust Fund (TETFUND) is effectively handling this responsibility. The employability of the graduates from a school affects the quality of the school[6]. It was hoped that with better funding for education, people would have more chances to find jobs in both the government and private sectors. This is a concern that employers have because they are not happy with the low skills and abilities of graduates. As a result, graduates are not suitable for available job positions. The graduates do not have other extraneous skills apart from academic qualifications. It is now on record that the massive rail network currently going on all over Nigeria is in the hands of the Chinese who are not finding Nigerian youths employable. This again shows clear evidence of the skills mismatch occasioned by the outdated school curriculum. Noting that entrepreneurship is the driver of the market economy, the school, therefore, should be concerned with the process of transition from the College to the workplace. This can only be achieved with an entrepreneurship skills framework that is capable of bridging the skills gap existing between the Colleges of Education and the labour market. It is visibly evident that the majority of the tertiary institutions in Nigeria today introduce entrepreneurship into their programme without any clear-cut framework and at variance with the discipline objectives.

It was realized that Higher institutions in Nigeria have seen the introduction of entrepreneurship studies as the only antidote to overcoming the rate of graduate unemployment. This no doubt is an admission of curriculum failure. Nevertheless, they have fallen short of carefully understudying the existing curriculum to be able to isolate the flaws for the necessary remedy. The mad rush for the establishment of the Department of Entrepreneurship Studies would only complicate issues because it fails to recognize discipline peculiarities and differences. To this end, with a very strong belief that if the entrepreneurship potentials of the skill domains in each discipline were explored and upscale, the problem of graduate unemployment would have been handled. Consequently, this study aimed to identify the array of entrepreneurship skills opened to the students of electrical technology in a broader sense so that future studies would concentrate on the constructs generated for deeper and in-depth analysis to isolate the most useful ones.

The objective of the study

The following objective is designed to guide the study:

1) Explore the entrepreneurship skills required by Electrical Technology students based on document analysis.
2) Explore the entrepreneurship skills required by Electrical Technology students from the perspective of academics and entrepreneurs.
3) Develop a word tree of entrepreneurship skills framework needed by Electrical Technology students in Nigeria.

The study seeks to provide answers to the following research questions:

1) What is the entrepreneurship skill required by the students of Electrical Technology based on document analysis?
2) What are the entrepreneurship skills required by the students of Electrical Technology from the perspective of the critical stakeholders?
3) What is the topology of entrepreneurship skills needed by the students of Electrical Technology?

2. Literature review (conceptualizing entrepreneurship)

The term entrepreneurship has been differently described by many scholars depending on the scope of their work, thereby, making the concepts to be complex. The idea of entrepreneurship has changed over time and people have different ways to define it. In simpler terms, innovation is when people deliberately search for and analyze changes that can bring economic and social advancements[7]. Entrepreneurship means using creativity, taking risks, and being innovative to start or grow a business. It involves managing the business well and can happen in a new or existing company. Entrepreneurship is when someone or a group of people create and run a business. It can happen inside or outside of a company. Being an entrepreneur means you need to have certain technical abilities, as well as the right mix of opportunities, abilities, and resources[7]. This equates to entrepreneurial-specific skills and an entrepreneurial mindset[8]. It has been argued that an enterprise graduate is an asset to an organization[8–10]. Kinash[11] equally, stresses the importance of industrial training in the development of graduate employability. Although entrepreneurship education can be seen in the curriculum of Electrical Technology in Colleges of Education in Nigeria, it is not taught to develop the potential of the students to be able to increase their knowledge of job search and employability[10]. Kinash[11] emphasizes the importance of entrepreneurship in bolstering graduate employability. Therefore, entrepreneurship in employability in this sense is designed to equip students and prospective graduates of Electrical Technology with the skills that would make them attractive, meet the requirements of the employers, and possibly be self-reliant. This is called an entrepreneurial mindset. The entrepreneurial mindset skills in this category are innovation, creativity, resourcefulness, motivation, strategy and vision[9]. Broadly, therefore, for this study, entrepreneurship skills suitable for the promotion of graduate employability are classified into Entrepreneurial specific skills and entrepreneurial mindset skills which consist of technical and non-technical skills[7,8,12–14].

Akingbade[15] conducted an Assessment of Entrepreneurship Skills Development on Employment Generation Strategy in Tertiary Institutions in Lagos State. This study shows that starting one own business is still the best way to make a lot of money that lasts in Nigeria. The text means that in Nigeria if more people learn how to be entrepreneurs, it can help to reduce unemployment and poverty. Due to the growing poverty and unemployment in Nigeria, the government at all levels has decided to focus on supporting entrepreneurship and small businesses. This is seen as a possible solution to generate more jobs and reduce the widespread poverty and unemployment issues in the country. The research suggests that it is important for students who graduate from higher education institutions to have basic entrepreneurship skills. This will make them more likely to find a job, become employers themselves, and be able to compete in the global business world. By doing so, it can help increase employment opportunities and reduce poverty. Nigeria has created fourteen social programs, but they were not focused on teaching graduates how to start their businesses or find jobs. These programs should have prepared graduates to be able to work and also create jobs for others in Nigeria. Different Nigerian governments have tried various ways to create jobs and help people in need, but most of them haven't worked like they wanted. This is because most of the programs that were implemented did not focus on helping graduates become more employable or self-employed, or teach them the skills they need to start their businesses.

Maigida[16] focuses on teaching entrepreneurial skills in technical vocational education and training as a strategic approach to empowering the youth in Nigeria. However, the study did not provide a clear plan for achieving the goal.

Chukwurah[17] examines the process of changing how entrepreneurship is taught in Nigerian universities to help improve the country's economy. Entrepreneurship education helps people learn how to start their businesses and use their creativity to solve problems. This can help them avoid poverty and the stress of working for someone else. The research found that Nigeria, like many other poor countries, has many difficult

problems and tough situations. These problems include not having enough money, not having jobs, fighting with each other, and being sick. Some educational programs focus on teaching entrepreneurship in vocational and technical education instead of fostering the mindset and skills needed to be an entrepreneur in different fields. There is not enough information available to teach people about starting businesses. There are only a few or not many plans made for teaching people about starting businesses. The paper suggests adding more job-related and hands-on learning to the curriculum. It also suggests that creating a program where new graduates can learn and gain work skills and experiences would be beneficial. It suggested that the government create a program where students are paired with successful local entrepreneurs and given educational opportunities.

Jonathan[18] conducted a study on Entrepreneurship Education and the Challenges of Graduate Employability in Nigeria. Start-up businesses are the main creators of new jobs in the economy. Young people can feel more confident in their potential to become business owners in the future because they have opportunities to learn about entrepreneurship in school. The study found that learning about how small businesses work and the challenges faced by their bosses can help employees become more successful. The findings highlighted the importance of teaching entrepreneurship to students of all ages, starting from elementary school and continuing with skill development for people who are already entrepreneurs. The research discovered that many things are stopping entrepreneurship education from being successful in Nigeria. These things could be impacting the number of graduates who can find jobs. Increasing unemployment leads to individuals losing their income, which causes a decrease in revenue for governments, slows down economic growth, and puts more pressure on government spending for social benefits in developed countries. There is a shortage of teachers and trainers who have hands-on experience in teaching about entrepreneurship or being entrepreneurs themselves. In Nigeria, most entrepreneurship teachers come from traditional fields like economics or business administration.

Olojuolawe[19] looked at the skills that electricians need for jobs in the 21st century. They found that colleges in Nigeria are not teaching the right skills that are needed in the job market. The research discovered that Colleges of Education in Nigeria do not have the necessary skills that employers in the job market are looking for. There is a big problem of wasted government money on Technical Education because the skills being taught in school do not match what is needed in the workplace. The number of unemployed young people keeps going up. This shows that Nigeria's education system has not done enough to match the skills students learn in college with the needs of employers. This is especially true for graduates of Electrical Technology who cannot find jobs and are left without purpose.

Agwu et al.[20] conducted a case study to see if Entrepreneurship Education helps people start new businesses. Findings showed that learning entrepreneurial skills can help create new ventures. If this action is done, it is believed to lower the number of people without jobs in Nigeria. This would also decrease the violence, poverty, and separation between citizens. Regular training and retraining of teachers both locally and internationally to keep them updated on modern ideas and teaching methods for their subjects. The study discovered that the educational system in Nigeria does not have what is necessary to prevent a lot of people from being unemployed in the country. Even though the government made it mandatory for universities and colleges to teach entrepreneurship, it is not enough. The paper suggests that Entrepreneurship should be taught as an important part of both formal and non-formal education. They propose that every country should have effective methods in place to achieve this. Additionally, they recommend that students should have opportunities to gain practical experience in entrepreneurship at all levels of education. It should be mandatory for everyone to receive at least one education related to entrepreneurship.

Adekunle[21] explores how university graduates in Nigeria develop new ideas and gain skills to make a positive impact on society. The research discovered that different ways of being innovative in society had a good and important impact on the development of skills in Nigerian university graduates. If graduates don't learn the skills they need, they might not be able to find a job or run a business well. Many universities in Nigeria focus on producing a large number of graduates without considering whether they have acquired valuable skills. As a result, many graduates do not have the necessary skills and are not able to contribute effectively to the growth of a company, even though they have the required professional or technical qualifications. The research found that graduates might not get jobs because they don't have the necessary skills and abilities. They need these skills to be qualified for jobs and be able to compete with others. These skills are also important for them to help companies succeed. The research suggests that changes should be made to the curriculum to encourage the use of social innovation in developing important skills, to help fill the gap in skills among Nigerian graduates.

Ubogu[22] conducted a study on teaching Entrepreneurship in Nigerian universities. He observed that the main problem preventing progress in entrepreneurship studies is the common belief that being an entrepreneur is something you are born with. But people don't believe this idea anymore because there are many new entrepreneurship classes. The research found that training programs in developing countries, like Nigeria, have focused more on teaching basic knowledge and skills. Many colleges and universities are still producing students who struggle to find jobs and can't support themselves. Even though the government is trying to create jobs, it does not seem like they are making any progress in solving the problem of unemployment for graduates in Nigeria.

The main purpose of Technical Education is to provide gainful job opportunities for the youths who are preparing to enter occupations in agriculture, business, and home-making, industrial and Technical fields like Electrical/Electronic[22]. Technical Education plays a key role in the overall development of a nation[23–27]. Electrical Technology is the driver of any technological breakthrough[28]. Specifically, an Electrical technician is a person who is very good and versatile in Electrical works, has an in-depth knowledge of Analog electronics, good cost-cutting and circuit optimization, values time, is self-confident, has adequate knowledge of Motor related apparatus and transformers-related core applications, and mechanisms, High Tension (HT) related lines, and possess knowledge of power generation equipment and above all, he troubleshoots[29–33].

Some of the metal analysis for the study is shown in **Table 1**.

Table 1. Metal analysis.

S/N	Author	Volume	Title	Journal	Methodology	Strength	Weakness/Recommendation
1	Lubna Rashid[34]	Sustainability 2019, 11, 5343; doi:10.3390/su11195343	Entrepreneurship Education and Sustainable Development Goals: A Literature Review and a Closer Look at the Fragile States and Technology-Enabled Approaches	http://www.mdpi.com/journal/sustainability	A systematic literature review was conducted following Tranfield et al.'s methodology and the PRISMA guidelines.	Technology alone cannot be considered a magic problem solver. The success of using technology to tackle education challenges highly depends on technology customization to local culture and traditions, whether proper analysis of local needs was performed, availability of adequate technical maintenance and the provision of local guidance on technology use	Undoubtedly, findings from this study are not conclusive and are dependent on the literature. Search criteria used in this systematic review. For example, literature from development economics, pedagogical sciences, and computer science has not been explicitly included in the main review. Conducted in this paper. In addition, alert and warning countries are not all the same and each has unique characteristics and challenges that need to be carefully evaluated and considered when Formulating solutions. This article simply aims to emphasize some of these challenges to open the door for contemplation and future investigation

Table 1. (*Continued*).

S/N	Author	Volume	Title	Journal	Methodology	Strength	Weakness/Recommendation
2	Doemelam, Chinedu Christian, Ebeze, Uche Victor, NwachukwU, Chidiebere, Odoemelam, Queen Ekemeye, Okwugiogo R, Daniel Ndudi[35]	Volume 5, 2020	Socio-Demographic Predictors of Social Media-Based Skills Acquisition among Undergraduate Students in Selected Nigerian Universities	Journal of Mass Communication, Igbinedion University, Okada	Our data depended on a sample of 453 respondents. A sample is representative of the population from which it is taken if the characteristic of the sample mimics those of the population. To ensure representativeness, all the categories or traits of the studied population were allowed to be selected.	Social media (YouTube, Facebook, and Instagram) are interactive media that further the communication process of skill acquisition. In the same vein, skill acquisition is 7framework by the policy because it correlates with self-reliance, job creation, and economic growth. These factors provided a context for the examination of the demographic traits (age, gender and employment status) that are associated with undergraduate students' use of social media for skill acquisition.	The finding that the majority of undergraduate students are aware that social media are skills learning platforms, has overarching Implications for policy drive on economic development in Nigeria. The paper recommends that policy drive economic development in Nigeria should use evidence-based studies on social media skills acquisition as baseline data to drive policy actions on social media and economic development in Nigeria. In addition, the need to use social media as a key platform for targeted messages promoting entrepreneurship among the youth population has become imperative as a practically effective policy direction.

Table 1. (*Continued*).

S/N	Author	Volume	Title	Journal	Methodology	Strength	Weakness/Recommendation
3	Mazen J. Al Shobaki, Samy S. Abu Naser, Youssef M. Abu Amuna, Suliman A. El Talla[36]	Vol. 2 Issue 1, January – 2018, Pages: 168-189	The Level of Promotion of Entrepreneurship in Technical Colleges in Palestine	International Journal of Engineering and Information Systems (IJEAIS)	Initial Data: The study was carried out in the field by distributing questionnaires to study the vocabulary of the study, collecting and gathering the necessary information on the subject of the study, and then unloading and analyzing it using the statistical program (SPSS) and using the appropriate statistical tests to arrive at indications of value and indicators that support the subject of the study. And some personal interviews conducted by the researchers with those involved to obtain some undocumented data in writing and to clarify some views	The attention of the technical colleges on the importance of promoting entrepreneurship, because of their role in reducing the problem of unemployment. 2. The importance of linking technical education and promoting entrepreneurship to the Palestinian society in general and the Gaza Strip in particular. 3. The importance of urging decision-makers in technical colleges to promote interest in leadership and to put their courses in all technical education programs in these colleges.	These findings are consistent with Al-Sultan, who found that interest in leadership education, leadership skills development, support of government and private institutions, training and self-development are among the most important factors for entrepreneurship success. The results of the study showed that there is a high degree of approval by the members of the study sample on the field related to the pilot characteristics and AlKhazandar which came to recognize the Palestinian universities for the importance of leadership and adoption of courses in the pilot programs of business administration, and some universities have established business incubators to build pilot projects and provide part of the financial support for entrepreneurs.

Table 1. (*Continued*).

S/N	Author	Volume	Title	Journal	Methodology	Strength	Weakness/Recommendation
4	Peter Karanja, Adamson Maingi, Mercy Nguyo Wangui, Samuel Mutahi Wanjohi, Catherine Maina[37]	Vol. 8, No.1, January 2018	Opportunity-Based versus Necessity-Based Entrepreneurship Preference for Self-Employment and Entrepreneurial Involvement among College Students: A Case Study of Kirinyaga University	International Journal of Academic Research in Business and Social Sciences	Sampling Technique.	These theories were significant in explaining the reasons behind student engagement in Entrepreneurship. The student entrepreneurial involvement was tested during their present academic life and stay in college and their likelihood of engagement after college. An attempt was made to analyze the levels of student entrepreneurial engagement from 'never' to 'actively involved' and a possible framework highlighted	The research findings reveal that negative motivations would play a grand role in youth engagement in entrepreneurial endeavours. This comes on the backdrop of efforts by the government of Kenya to entice the youth into entrepreneurial engagements through measures such as the introduction of business-related courses in schools, middle-level colleges and universities and the introduction of youth funds. There is a need for the government to create a more conducive environment to attract the youth into self-employment/Entrepreneurial engagement that would ensure sustainability, rather than the youths entering into entrepreneurship/self-employment for lack of better options in the economy

Table 1. (*Continued*).

S/N	Author	Volume	Title	Journal	Methodology	Strength	Weakness/Recommendation
5	James Edomwonyi Edokpolor, Robinson Osarumwense Owenvbiugie[38]	Problems Of Education In The 21st Century Vol. 75, No. 6, 2017	technical and vocational education and training skills: an antidote for job creation and sustainable development of the Nigerian economy	PROBLEMS OF EDUCATION IN THE 21stCENTURY Vol. 75, No. 6, 2017	The design employed for this study was a survey research design. Survey research design (also called descriptive research design) uses instruments such as questionnaires and interviews to gather information from groups of individuals.	The results from research question two revealed that TVET to a very high extent can equip students with the skills to develop the Nigerian economy sustainably.	Stakeholders of TVET should endeavour to optimize the sufficient amount of resources (both financially and otherwise) to meet the needs of students and the society. The regular supply of state-of-the-art facilities should be collaboratively embarked on by governments and other major stakeholders to ensure the effective delivery of TVET programmes in Nigeria. The government should endeavour to provide adequate funds for TVET managers to be able to source for qualified manpower that would effectively teach TVET courses. The government should endeavour to implement an advocacy programme for the people of Nigeria to be aware of the relevance of TVET in job creation and sustainable development of the Nigerian economy

Table 1. (*Continued*).

S/N	Author	Volume	Title	Journal	Methodology	Strength	Weakness/Recommendation
6	Kheza Jonas Pitso[39]	Central University of Technology, Free State 16 June 2018	designing a framework for the advancement of lecturer capacity in developing graduate attributes at a technical and vocational education and training college	Submitted in the 11framework11 of the requirements of the Degree PHILOSOPHIAE DOCTOR (Psychology of Education	A case study design, framed in a mixed-method research methodology was used for this study. The method that the researcher used in this study is called the mixed method (concurrent triangulation design).	The entire research project provides the framework for the advancement of lecturer capacity in developing the Graduate Attributes in the Technical and Vocational Education and Training sector.	The framework explicitly outlines the set of skills and attributes that would ensure that graduates are successful in their academic and professional endeavours. Moreover, it highlights the importance of teaching, learning, and effective management of the curriculum and assessment. It asserts the implications for the lecturer's capacity, to equip the students with knowledge, skills, values and competencies that will enable them to improve their prospects for success in industry and life at large.

Table 1. (*Continued*).

S/N	Author	Volume	Title	Journal	Methodology	Strength	Weakness/Recommendation
7	Ugochukwu Okolie, Olayink, a Binuomote, Catherine Osuji, Chinyere Augusta Nwajiuba[40]	Australian Journal of Career Development. July 2020 DOI: 10.1177/1038416220916814	How Career Advice and Guidance can Facilitate Career Development in TVET Graduates: The Case in Nigeria	Australian Journal of Career Development. July 2020 DOI: 10.1177/1038416220916814	This study, conducted in Nigeria, adopts a qualitative research design intended to capture comprehensive and rich information by offering participants an opportunity to speak freely about their experiences regarding the subject of study.	The findings indicated that building strong linkages between the TVET system and industry might be an efficient strategy for fostering students' career development, aspirations, and choices, and building effective linkages between TVET and industry might have the added benefit of facilitating students' transition to industry. The findings also highlight for TVET practitioners, policymakers, industry and TVET curriculum developers how CAGC services and programs in the TVET system might help graduates to develop labour-market-relevant skills and knowledge for employment.	Despite the contribution of this study in extending the TVET literature in the Nigerian context, there are some limitations. The study did not examine the possible challenges that could emerge from establishing CAGC services centres in all TVET departments and from building CAGC activities and programs into the TVET curriculum.

Table 1. (*Continued*).

S/N	Author	Volume	Title	Journal	Methodology	Strength	Weakness/Recommendation
8	Fraser C, Duignan G, Stewart D, Rodrigues A[41]	Journal of Teaching and Learning for Graduate Employability, 10(1), 157–172. (2019).	Overt and covert: Strategies for building employability skills of vocational education graduates.	Journal of Teaching and Learning for Graduate Employability, 10(1), 157–172.	A mixed method, case study methodology was adopted for this research. Case studies allow an in-depth examination of topics over time, related to processes and practice, and for this study, was particularly useful for gathering evidence of how employability skills were being taught in the classroom, and why teachers had adopted their selected approach.	This paper has described how a sample of 13framework13 teachers in Aotearoa New Zealand is currently embedding ways of enhancing the employability of their students. By linking the13framework inquiry to international initiatives, a wide literature about employability, work-readiness and preferred graduate attributes, and existing national skills 13framework.	the study reported here aims to illustrate practical strategies higher education practitioners are using to address the 'skills gap' deplored by employers and industry. By garnering case studies and examples from 23 teachers across seven organizations and multiple disciplines, it is hoped that the recommendations and strategies for good practice are relevant and applicable across the sector.

Table 1. (*Continued*).

S/N	Author	Volume	Title	Journal	Methodology	Strength	Weakness/Recommendation
9	Nathan Green, Michelle (Xiang) Liu, Diane Murphy[42]	Information Systems Education Journal (ISEDJ) 18 (3) ISSN: 1545-679X June 2020	Using an Electronic Resume Analyzer Portal (eRAP) to Improve College Graduates Employability	Information Systems Education Journal (ISEDJ)	We first selected a set of job categories which were reflective of the students currently in the IT program, many specializing in cybersecurity. Some were designed to reflect the various aspects of the IT field and included 'Cybersecurity', 'Data Scientist', 'Software Engineer', 'Cloud Computing', 'Digital Writing', 'Management Analyst', 'Mathematician', and 'IT support'.	The ultimate goal is to make the eRAP a live, fully functional tool that each of our IT and cybersecurity students can submit their resumes anytime for real-time, reliable feedback on resume enhancement to increase the likelihood of getting a high-paying first job in their field of choice.	Finally, the authors recognize that they are in the early stages of success with this project. Even though an initial evaluation of e-RAP has been conducted and delineated in this paper, a more systematic and rigorous evaluation process to assess the effectiveness of the tool is under design and implementation.

3. Methodology/Materials

The study is a qualitative study involving document analysis and interview protocols. This method was used to obtain the direct view of experts in the chosen domain. Consequently, a total of 80 journal articles on entrepreneurship skills particularly those that have to do with electrical technology or a semblance of it were retrieved for the study. The search engine was principally Google Scholar. The purposive sampling technique was used for the study. Therefore, the interview protocols consisted of Academics who teach Electrical Technology and Entrepreneurs who are the employer of labour. Basing the sample size on theoretical saturation, the sample size for the study involved 12 participants. 7 were in the academics while the remaining 5 were from the industry[43–47]. The search framework for the entrepreneurship skills of the students of electrical technology is shown in **Figure 1**.

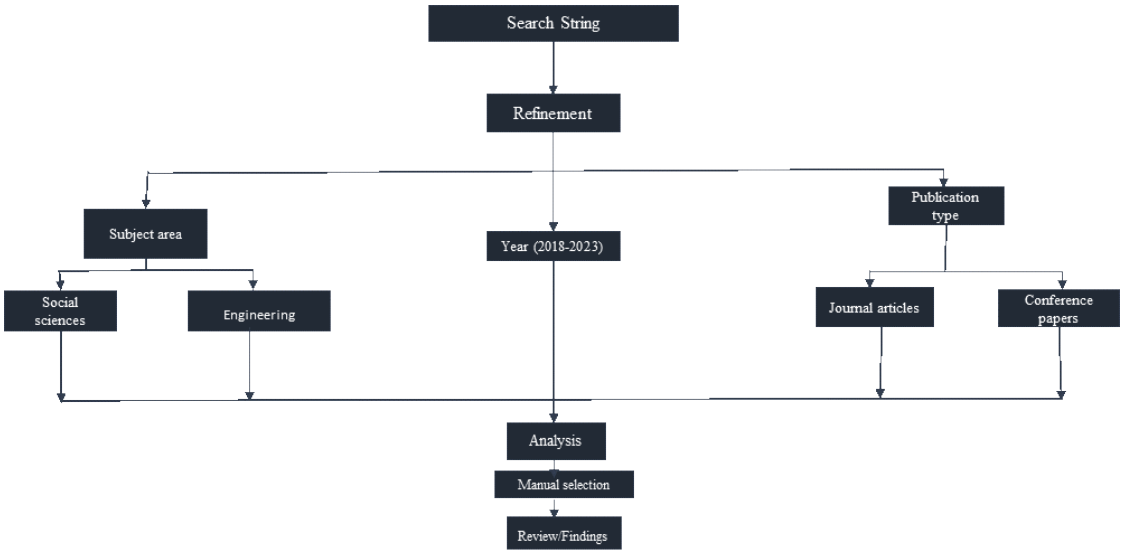

Figure 1. Entrepreneurship search string.

A total of 80 published articles were retrieved from the database. These were reduced by the scope set for the search string to 27.

To be able to narrow down the search, the following criteria were used: (i) papers published between 2018 and 2023 (ii) papers in Engineering and Social sciences (iii) Journal articles and conference papers (iv) papers that discuss entrepreneurship (v) technical education (vi) vocational and technical education (vi) electrical technology. The number was reduced to 50 with these refinements. The study also involved the development of a metal-analysis table that captures the (i) authors' information (ii) year of publication (iii) journal type (iv) title of publication (v) methodology (vi) strength of the publication (vii) weakness of the Publication. The member check method was adopted to ensure the validity and reliability of the data for the document analysis. while the triangulation method was used to validate the data for the interview. This was done to ensure that the views of the participants were not misrepresented[48].

The Journal articles and the policy document of government were analyzed thematically as shown in **Table 2**.

4. Results and findings

Findings related to document analysis are shown in **Table 2**.

Table 2. Results and findings for document analysis.

Competency Document	**JOURNAL ARTICLES (JR)**						**POLICY DOCUMENTS (PL)**			
	JR1	**JR2**	**JR3**	**JR4**	**JR5**	**JR6**	**PL1**	**PL2**	**PL3**	**PL4**
TASKS PERFORMANCE										
Entrepreneurial (Electrical specific skills)										
Transformers	*		*		*		*		*	*
Electrical power	*			*			*	*	*	*
Electrical installation							*	*	*	
Electrical Design and drafting	*		*							
Electrical machine operation		*			*					
ICT	*		*	*	*	*				
Safety	*		*				*	*	*	*
Competency	**Electrical Mind-set skills**									
Integrity	*	*	*							
Human relation		*		*						
Leadership				*						
Workshop Management	*				*					
People management	*		*							
Innovation	*	*		*						
Problem-solving	*			*						
Negotiations	*		*	*						
Leadership										
Conflict Resolution	*				*					
Interpersonal Relations	*		*	*						
Financial management	*	*	*							
Personal attributes	*	*		*	*					
Self-management skills	*									
Communication skills						*				
Technology skills	*		*							
Creativity	*			*						
Tolerance to stress	*			*						
Collaboration										
Management and marketing skills	*									

The thematic analysis was used for the responses obtained from the participants. This is shown in **Table 3**.

Table 3. Interview results and findings for electrical-specific skills.

Example of responses	Respondents	Codes	Themes
…Very, very essential. It acquits them with the field of Electrical Technology. There is nothing they are learning if there is no design and construction in their curriculum…an example is extension boards. …Is part of what we are teaching the students…. The NCCE emphasizes it…	PE1 PE3 PE4 PE6 PA1 PA2 PA3	Workshop practice	Design and construction
…They are technicians. They must be able to detect faults and rectify them… knowledge of home appliances and possible faults is important. There is room for workshop practice in the timetable. …As I said, they are exposed to workshop practice… This the areas where they are exposed to different types of repairs and maintenance.	PE2 PE3 PA1 PA4	Detect faults	Troubleshooting
…They must know surface wiring, conduit, and other associated installations. …a standard workshop for practice. …They must have a standard workshop for practice. Both surface wiring, conduit, and other associate installations…	PE1 PE3 PE4 PE6 PA1 PA2 PA3	Wiring	Installation
Experience matters…teaching in the classroom doesn't align with the world of work…practical. In-depth knowledge in generator repair, service, and maintenance, diesel engine repair, service and maintenance, gas line servicing…the world is now talking about green energy; gas is important. Rewinding of electric motors, installation of electric machines and fittings…house wiring	PE1 PE4 PE6 PA1 PA2 PA3	Motor	Electrical machine operation
There are no two ways to do it. Electricity is a silent killer…No one plays with electricity. The best electrician is one who knows how to use measuring instruments. It is well covered by the curriculum and syllabus…Use of ammeter, multimeter, ohmmeter, and the rest. The best electrician is one who knows how to use measuring instruments	PE1 PE3 PE4 PE6 PA1 PA2	Testing	Measuring instruments
…every home is now growing green. It is an essential aspect of electricity. Most components cannot work with AC. …Solar and wind technologies are new areas that are important to electrical technology. It is an essential aspect of electricity. Most components cannot work with AC… Knowledge of transformation from AC to DC is important. …Solar and wind technologies are new areas that are important to electrical technology	PE1 PE3 PA1 PA2 PA3	Solar and wind technologies	Versatility in electrical works
It is an essential aspect of electricity. Most components cannot work with AC… Knowledge of transformation from AC to DC is important. …knowledge of transformation from AC to DC is important	PE1 PE3 PE4 PA1 PA2	Type of current	Winding

Table 3. (*Continued*).

Example of responses	Respondents	Codes	Themes
…very important for one's safety and appliances. … students need knowledge of protective equipment. They need to be aware of safety with job hazards. …the first thing we teach the students. …it is necessary to avoid electric shocks or death. They need to be aware of safety with job hazards.	PE1 PE3 PE4 PE6 PA1 PA2 PA3	Job hazards	Safety
Very well. We are talking about voltage handling… Very well. We are talking about voltage handling… The transformer is covered by the syllabus… we do teach theory and practical…	PE4 PE6 PA1 PA2	Voltage handling	Transformer

Based on the interview findings, all the participants agreed that specific skills are important for Electrical Technology students to be self-reliant or secure employment. The summary of the findings from the perspective of the Entrepreneur and Academics is given in **Table 4**.

Table 4. Summary of interview findings for electrical-specific skills.

Sub constructs	Entrepreneurs					ACADEMICS						
	PE1	PE2	PE3	PE4	PE5	PA1	PA2	PA3	PA4	PA5	PA6	PA7
Electrical Design and construction	*		*	*		*	*	*	*	*	*	
Troubleshooting		*	*				*		*			*
Electrical Installation	*			*		*			*	*	*	
Electrical machine operation	*			*		*			*	*	*	
Electrical servicing and repairs	*	*	*	*		*	*		*	*		*
Versatility in electrical works	*		*						*	*	*	
Electrical Winding	*		*	*					*	*		*
ICT	*	*	*	*	*	*	*					
Safety	*		*	*		*			*	*	*	
Transformer	*			*		*		*	*	*		

Finding interview protocols on Mindset skills is provided in **Table 5**.

Table 5. Interview results and findings for mindset skills.

Example of Responses	Participant	Code	Theme
Human relations are essential in any business…ability to absorb shocks, open-mindedness, tolerance, and workshop management.	PA1	Practical training	Tolerance
The job of an electrician requires scientific applications… It helps understand basic electrical scientific symbols and their interpretations. Without it, it will be difficult to collect data, for troubleshooting purposes. Very, very essential. That is why it is a major condition for admission into the Programme. Without a science background, you cannot do anything in Electrical…it is the application of knowledge…	PE1	Scientific	Collaboration

Table 5. (*Continued*).

Example of Responses	Participant	Code	Theme
Elements of logic studies would enhance their thinking skills They are not too bad. But, there is always room for improvement… You know knowledge is not static. That is why they need to be upgraded. As a course, we don't have it. All we teach here are practical skills. The curriculum we are operating is no longer fashionable to the reality of the labour market.	PA4 PE4	Critical thinking	Leadership
Accounting skills, management skills…ICT facilities for design and troubleshooting…using software for the designing before hardware… are not in the curriculum That does not mean all of them can use it very well. How many of us among the academics have laptops and talk about operating them? Our ICT skills are still very low.	PA1 PA3 PA4 PA5 PE1 PE2 PE4 PE5	Knowledge of computing	Information Communication Technology

The summary of the interview findings for the mind-set skills is given in **Table 6**. Five constructs emerged for the mind-set skills. The interview consisted of participants from the academics and the industry.

Table 6. Summary of interview findings for mind-set skills.

Sub constructs	Entrepreneurs					ACADEMICS						
	PE1	PE2	PE3	PE4	PE5	PA1	PA2	PA3	PA4	PA5	PA6	PA7
Tolerance			*			*						
Collaboration	*											
Leadership				*					*			
Information Communication Technology	*	*		*	*	*		*	*	*		

The word view of the item pool from the document analysis is provided in **Figure 2.** A careful examination shows the weight of electrical ability expected of the students.

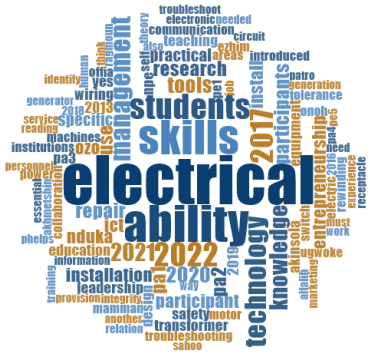

Figure 2. Word cloud of entrepreneurship skills framework for electrical technology students.

A further analysis of the pooled-constructs using NVIVO 11 shows the broad entrepreneurship-specific abilities expected to be mastered by electrical technology students. This is shown in **Figure 3**.

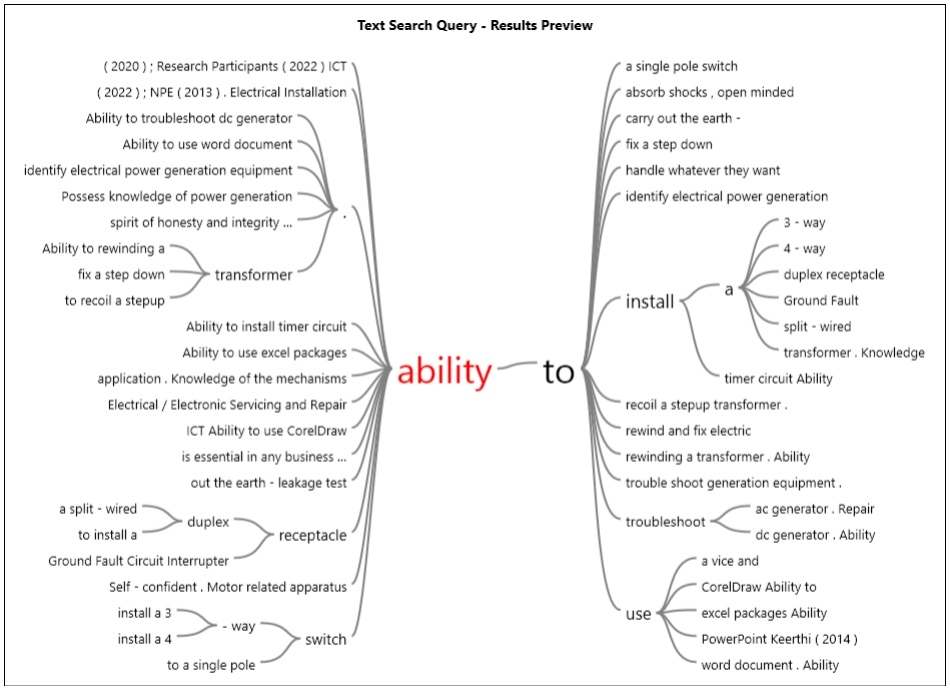

Figure 3. Word tree of entrepreneurship skills framework for electrical technology students.

The totality of the broad constructs emanating from the document analysis and the thematic analysis of the interview with the experts provided an outlook of the entrepreneurship electrical-specific skills and the mind-set skills as shown in **Table 7**.

Table 7. Interim entrepreneurship skills framework.

Entrepreneurial electrical-specific skills	**Electrical mindset kills**
• Electrical versatility	• Leadership
• Windings	• Managerial and marketing skills
• Troubleshooting	• Communication
• Electrical power	• Integrity
• Electrical installation	• Innovation
• Electrical/electronic servicing and repair	• Problem-solving
• Electrical merchandise	• People Management
• Electrical Design and Drafting	• Professionalism
• Electrical machine operation	• Collaboration
	• Negotiation
	• Human Relations
	• Technology
	• Critical thinking
	• Conflict resolution
	• Workshop management
	• Personal attributes
	• Financial management
	• Self-Management

5. Discussion of findings

The findings from the study revealed an array of skills and constructs expected to be acquired by an electrical technology student before he or she can be deemed to be proficient and marketable. These were the aggregates of skills based on the document analysis and the experts' views from the Academics and the Industry. The sub-sets of the electrical-specific constructs are design and construction, troubleshooting, electrical installation, machine operation, measuring instruments, versatility, winding, transformer, and safety skills. At the same time, the expected Mindset skills are; tolerance collaboration leadership, and knowledge of Information Communication skills. The majority of the participants agreed that these skills are essential for the entrepreneurial skills development of Electrical Technology students. Findings from the literature show that the students desired entrepreneurship skills to be able to reduce the menace of unemployment. Specifically, some of the broad recommendations of researchers include analytical and problem-solving, negotiation, marketing, leadership, motivation, and innovation. A critical examination of the results of the document analysis in **Table 2** shows that most researchers favoured mindset skills at the expense of the electrical-specific skills as desired by the expert participants who invariably are the end users of the electrical graduates. Consequently, there is a need to conduct an in-depth analysis of the study to obtain valid constructs suitable for the entrepreneurial ability of Electrical Technology students in Colleges of Education in Nigeria.

6. Conclusion and recommendation

The findings of this study show the aggregate of entrepreneurship skills necessary to be acquired by Electrical Technology students in Colleges of Education. A critical look will show a merge of both specific and mindset skills required to be employable. This clearly showed that the possession of academic qualifications alone in most cases created extra burdens for employers in terms of human capital development that has to do with the instant retraining of new recruits both locally and abroad. The generated constructs in this study are broad and may be very difficult to implement. The majority of the papers used for the study relied on document analysis and opinions. Little studies existed on quantitative studies. Therefore, a deeper study is recommended to overcome the challenges of narrowing down to the specific skills required by each domain of specialization. This will ensure a valid, specific and handy construct that could be included in the entrepreneurship skills framework for the students of electrical technology students. This is the only way the job search skills of the students and self-reliance drive can be guaranteed. The study will no doubt increase the body of knowledge in entrepreneurship skills for electrical technology. It ultimately provided a base for theoretical and practical pursuits in the implementation of entrepreneurship for the students of electrical technology. Similarly, the current study is recommended for a descriptive statistical analysis of entrepreneurship data which deviated from the focus of the study.

Author contributions

Conceptualization, OSR; methodology, OSR and SKJ; validation, AOO and AMG; formal analysis, OSR and SKJ; investigation, SFB and AMG; resources, OSR and AMG; data curation, OSR and AMG; writing—original draft preparation, OSR; writing—review and editing, AMG and SKJ; visualization, SKJ; supervision, OSR; project administration, OSR and AMG. All authors have read and agreed to the published version of the manuscript.

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Conflict of interest

The authors declare no conflict of interest.

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