

Vocational education's growing focus on employability skills: A bibliometrics evaluation of current research

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ABSTRACT

The study aimed to investigate one of the search's core issues, 'employability skills', and their relationship. It also attempted to recognize the valuable contributions of writers, journals, governments, and institutions worldwide in pursuing employability skills. The quantitative study of bibliographic content is known as bibliometric analysis. Furthermore, it provides a broad view of a study subject that may be subdivided into publications, authors, and journals. This study offers a bibliometric summary of recent research on employability skills. Data was taken from the Scopus database between 2003 and 2022 and examined using VOSviewer software, open refine, tableau public, and Microsoft Excel. The data from the Scopus database are 1,070 documents. Researchers observed that researchers mainly focus on employability skills, higher education, engineering education, curricula, employment, and vocational education. Education and Training journal is the most appropriate journal for contributions, followed by Higher Education, Skills, and Work-based Learning journal, and then the Higher Education Research and Development journal. This study informs researchers by providing insights into basic background knowledge about employability skills for visual and quantitative research. Therefore, this method can observe the research gap in employability skills and more in-depth academic discussions. The study demonstrates how employability skills research has arisen and progressed, as well as prospective future research agendas.

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1. INTRODUCTION

In today's knowledge-based economy, the features of the working world and the credentials required of the workforce to fulfill the needs of the business are undergoing rapid transformation. The ever-increasing demand for generic skill traits that workers must possess is one of the most distinguishing features of knowledge-based enterprises [1], [2]. Workers must have abilities that are not exclusive to their field but are more general and may be applied in various contexts. These talents can be considered transferable skills. Workers in the knowledge-based economy need to be self-motivated, self-managing team players who can roll with the punches and thrive in an ever-evolving environment where they must constantly adapt and think on their feet to tackle novel problems and issues [3].

There is a significant disparity between the skills that job searchers in developing nations possess and the skills required by industry, as is evident from the general description of the employment sector in developing countries. The high unemployment rate is produced not only by the inability of the economy to create employment opportunities. Still, it is also frequently related to the competence of job seekers who do not fulfill the requirements as requested by the industry. If the lack of skills possessed by job searchers is linked to the world of education, then this problem is related to the quality and relevance of educational outputs. The field of education, notably higher education, is struggling with the issue of how to create graduates with qualifications pertinent to the working world's requirements to increase the absorption rate of graduates into the working world. The degree to which graduates are successfully integrated into the labor force should be a concern for today's institutions that provide higher education. In this knowledge-based economy age, it is crucial to pay close attention to the qualification standards required by the labor market for graduates to be accepted into work. In addition, higher vocational education institutions must deliver high-quality education and training to their students to ensure that their graduates can achieve the standards of qualification set forth by the business world.

The quality of the educational programming that students are a part of directly affects the degree to which they will emerge from their educational experiences equipped with specialized and general abilities (skills that may be applied in various settings). There is an interaction between a few different components while putting the academic program into action. These factors include raw input factors (the students) and instrumental input. According to the findings of some research [4]–[7], the learning system and the learning environment established while the learning process takes place are directly related to one another [8], [9]. These components of the learning process interact and contribute in some way to the improvement and maturation of students' abilities. A lecturer's methodology for putting learning activities into practice is outlined in the "learning system," which describes that methodology [10]. The method chosen for learning activities influences the environment in which the activities are carried out. The learning environment is tied to social, psychological, and pedagogical characteristics, which might affect knowledge creation, skills, and attitudes [11]. Students, both as people and as objects of the learning process, must reach their full potential to succeed academically and pursue a job in the working world.

A student's time in a vocational education program prepares them for work that requires practical abilities. The educational process is distinct from the academic direction education takes and has its goals and objectives. To promote the growth of a knowledge-based economy, work-oriented education that emphasizes acquiring and mastering technical and employability skills is required [12]. In addition to gaining technical abilities, generic skills must be developed during vocational education. Within the context of the education system for vocational purposes, assisting in both the learning environment and the learning system is of the utmost significance. Vocational education strives to generate entrepreneurial, educated, competitive graduates, have a national identity, and can build local advantages and compete globally. It is one of their main goals. Vocational education must create work-ready graduates. Vocational training aimed to produce financially self-sufficient citizens qualified to take on jobs of moderate complexity in the service and manufacturing sectors. Vocational education aims to create social jobs and sustain, accelerate, and increase worker quality to boost community production [13].

The vocational education curriculum is designed to make it easier for students to become proficient in a particular area of knowledge, both in hard and soft skills. It is done in the hope that these students will one day become human resources who are prepared to enter the workforce and participate in social life, have a positive attitude, and act following the norms that are prevalent in society. More specifically, the goals of vocational education can be stated as: i) Preparing students for higher education or expanding their primary education; ii) Enhancing students' abilities as community members to conduct reciprocal relationships with the socio-cultural environment and the natural surroundings; and iii) Enhancing students' abilities to develop themselves in line with the development of science, technology, and other relevant fields.

2. LITERATURE REVIEW

Yorke and Knight describe employability abilities as accomplishments, skills, and understandings. It increases graduates' chances of finding work and succeeding in their jobs, helping them, the labor force, the community, and the economy [14], [15]. Employability skills include personal attributes [16]. Employability skills are needed to secure, keep, and perform tasks [4]. Employers look for skills that improve a candidate's ability to work with others and adapt to new situations on the job. Yorke and Knight define employment potential as a combination of cognitive abilities, experiential competencies, and behavioral characteristics that predict future occupational success. Robinson's definition highlights the skills needed for successful workplace performance. Employability abilities are generic skills, attitudes, and behaviors employer's demand [17]. However, academic, personal management, and teamwork skills were included [18]–[21].

Employability skills are non-technical work requirements [22]. The five domains of employability can learn and applying knowledge, the ability to think critically, the ability to perform essential job functions, the individual's character qualities, and their enthusiasm for and interest in their work.

Implementing employability skills increases the competitiveness of human resources, especially the workforce [23]. Employability skills are essential for job success [20]. To enhance production and revenues, employees need employable skills. Learning systems in vocational education improve employability skills to provide human resources with industry-required abilities [24]. This study is part of the literature review mechanism. This research identifies inherent research gaps in the field of study and assists researchers in further investigating previously unexplored research areas. Academics have used various methods for reviewing the literature, including systematic scoping, meta-analysis, and weight analysis, to publish a recent literature review. This study employs bibliometric analysis techniques to take a comprehensive look at areas of study that collectively aid in identifying intellectual structures. This bibliometric study examines how studies on job readiness have changed over time. It identified the most recent gaps in employability skills. It is hoped that the results of this study will provide a theoretical basis for advancing research on employability skills by intervention in identifying determinants. It has been empirically proven to influence the development of employability skills. Finally, recommendations for issues that can be further investigated in the field of employability skills will be presented so that the scope of discussion and depth of analysis can help develop this field.

3. RESEACRH METHOD

3.1. Bibliometric analysis

VOSviewer version 1.6.17 was used to conduct bibliometric analysis [25]–[29]. The data that was obtained was used to plot figures and tables. According to the findings of some previous bibliometric research, the bibliometric indicators that were most relevant to this work and were addressed by it were as: document type; author; institution; country; cited document; journal source; and authors' keywords that frequently occur together [30]–[32]. By importing exported Excel data and considering phrases from the index keyword, the VOSviewer may produce a network of co-occurrence terms. Identifying the multidisciplinary approaches and the study directions go hand in hand with the co-occurrence of phenomena [31], [33]–[37]. The following programs were utilized to visualize the data: VOSviewer, Tableau Public, and Microsoft Excel.

Analysis using bibliometrics has existed since the early 20th century [38]–[40]. The term “bibliometrics” refers to a statistical method for compiling information about publications' authors, institutions, journals, and other relevant sources [41]. Due to the growing body of literature on a specific subject, it is helpful to employ a variety of quantitative rubrics to assess the most critical developments in that field [42]. A replicable review procedure that is open to public scrutiny ensures that the results of this analysis are reliable. By relying on objective evaluations obtained from computer programming, the inherent risk of doing a subjective literature study is minimized [43]. Bibliometric research is not limited by the passage of time or the number of data samples [44]. In a recent study, well-known pieces of bibliometric software such as VOS-viewer [45], Bibliometrics [46], Hist-Cite [47]–[49], CiteSpace [50], [51], CiteNetExplorer [52], SciMAT [53], and others have been utilized.

The applications of bibliometric analysis are widespread in various fields, including food science and technology [30], [54], [55], engineering [56], [57], computer science [31], medical [58], [59], education [60], economics [61], [62], and social science [63]. This analysis highlights the transformation of research topics, challenges, and emerging trends [64]. Hence, we need the information offered by this analysis to understand publication trends and potential applications.

3.2. Data mining

By conducting a subject search within the Scopus database, we could gain access to the scientific papers published between the years 2003 and 2022. Because many researchers consider Scopus the most comprehensive citation database and collection of abstracts of peer-reviewed literature, our study used Scopus as a bibliometric resource. It was the case because Scopus is more extensive than either Web of Science or PubMed [30], [65], [66]. In previous bibliometric research, the Scopus database was mined for data in an analytical capacity. The information obtained from Scopus, such as bibliographical details, keyword combinations, and cited references, contained helpful information.

On July 21, 2022, the data were retrieved for analysis. The search was completed in a single day to eliminate the chance of introducing unfairness owing to the daily citation updates to the database, which might lead to modest changes over time. It was done so that the search could be completed in one day [54], [67]. The search phrase ‘employability skills’ were utilized to locate publications in the published literature. The database produced a total of 1,162 articles, as shown in the flowchart of the research methodology

(Figure 1). Documents were chosen only on whether they were written in English and whether they were written in English had reached the level of final publication. A total of 1,088 publications were found to be connected to employability. The articles, conference papers, book chapters, reviews, and books provided the sources for the data utilized in this study. It resulted in the exclusion of 18 items. One thousand seventy different publications were found to satisfy the requirements for selection. Articles made up most of the published works (741). There are additional book chapters (74), reviews (36), and a book (10) in addition to the 209 conference papers. In this bibliometric study, the research procedure is depicted in Figure 1.

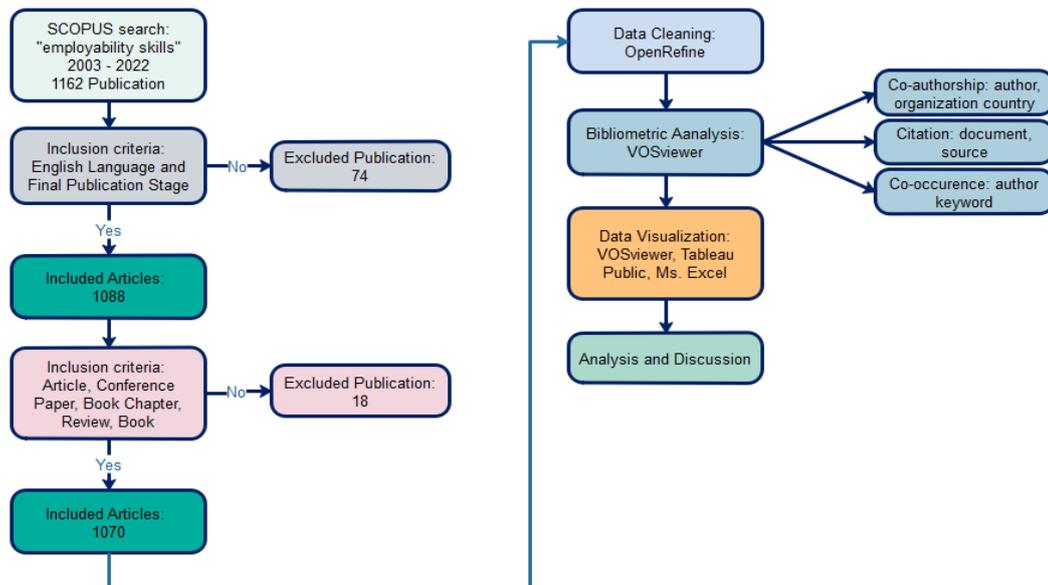


Figure 1. Research methodology flowchart

3.3. Data clean-up

The original dataset has some duplicate data. First, the software known as Open Refine was utilized to clean out the duplicated data. It is a desktop application that is free and open-source, and it is used for data cleansing and transformation [68], [69]. We converted plural and singular nouns into the appropriate form by classifying them as either singular or plural. For example, the word “e-learning” and “e-learning” were both changed to “E-learning”. The transformation of vocabulary into a single terminology also included observations with the same meaning [70]. Several mandatory manual inspections and assessments were conducted to ensure the relevant cleaning process. After that, the data were manually cleaned using a thesaurus file provided by the VOSviewer software.

3.4. Findings

A search on the Scopus database using keywords associated with employability skills between 2003 and 2022 yielded 1,070 papers. As seen in Table 1, articles are the most frequently cited category of publication, making up 69.25% of all citations. Conference papers account for 4.14%, book chapters account for 6.92%, reviews account for 3.36%, and books account for 0.93%. Articles written during this time account for the lion's share (by far) of all forms of publishing throughout this period. Scopus searches for the categories of documents listed in Table 1.

Table 1. Document type

Document type	Frequency	Percentage
Article	741	69.25
Conference Paper	209	19.53
Book Chapter	74	6.92
Review	36	3.36
Book	10	0.93

According to the findings illustrated in Figure 2, the total number of articles has a rising pattern. While this happens, the number of other publications, such as conference papers, book chapters, reviews, and books, tends to change from one year to the next. The number of articles produced between 2008 and 2015, as seen in Figure 2, rose to even higher levels between 2016 and 2019. Even though there was a decrease in the total number of papers published in 2015, it was still an increase over the previous year. With 36 articles, the Education and Training Journal received the most publication opportunities.

Meanwhile, there were 29 articles in the Higher Education, Skills, and Work-based Learning journal. During the same period, the number of conference papers was still relatively high, although it remained lower than the number of articles. At the ASEE Annual Conference and Exposition, 13 papers are the maximum number of conference papers that can be published. Publications that are presented at conferences are in high demand for several reasons, including: i) a conference paper has a more extraordinary reputation; ii) having it on exhibit at a conference where specialists from many different professions will be able to see it increases both its impact and its accessibility; iii) the quality of the paper received is high because not all scientific writings can be accepted at the conference; and iv) conferences are held more frequently while journals take a more extended amount of time to publish at the meeting, publications written by researchers are still in high demand.

Over the past five years, publication have dramatically increased. Assuming that around the same number of books and journals are published each year, there are two distinct periods: the first (which spans 2000 through 2012) and the second (2013–2022). The initial time segment (2003–2012). During the first decade, 172 works were published, accounting for 16.1% of the total number of pieces produced during this time frame. The first paper was published titled, ‘Consequences and policy implications for university students who have chosen liberal or vocational education in Canada: Labor market outcomes and employability skills,’ and it was published under this heading. A version of this piece appeared in the Higher Education Policy Journal and has received 10 citations since it was first published. According to the essay, one's educational path substantially impacts one's ability to successfully transition into a new environment. Regarding employment status, pay, job stability, and job satisfaction, the labor market prioritizes graduates of vocational programs above graduates of liberal arts programs. We anticipated that graduates with a liberal arts degree and a vocational degree would have very different employability abilities because of the considerable and constant variations in the labor market results that both graduates experience [71].

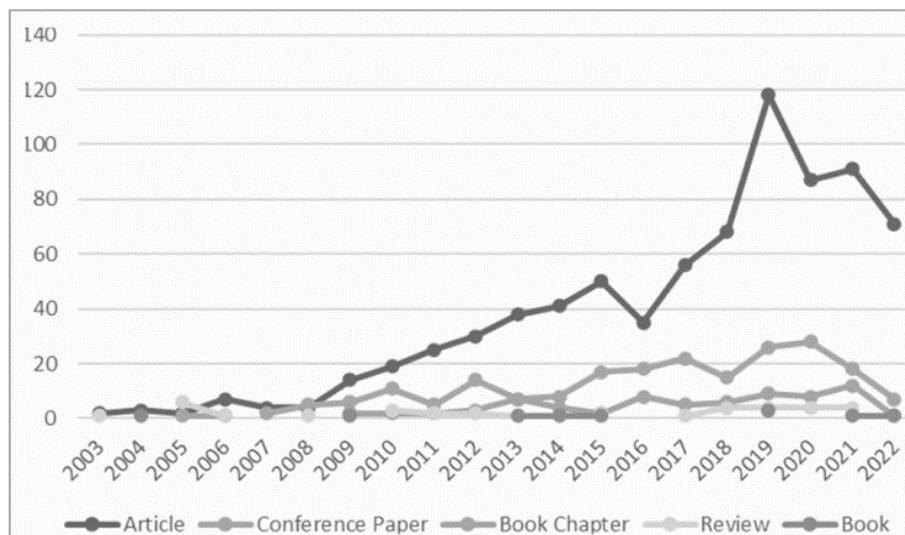


Figure 2. Number of the publications by document type

On the other hand, we were surprised to find little difference in the employability skills of graduates with liberal arts degrees and those with vocational degrees. Employers were more likely to use the employability skills of vocational graduates than those with a liberal arts degree. Disparities in using such talents are most likely due to issues with the flow of reliable signals between graduates and employers. A better-established network of vocational fields of study that connects employers, students, and the university has undoubtedly led to an increase in the amount of trust that graduates, and employers have in one another regarding the application of learned abilities.

The second period (2013-2022) saw 898 publications, accounting for 83.9% of total articles. The number of publications increased rapidly between 2013 to 2015 and from 2017 to 2019. Between 2015 and 2019, the number of articles fell. The COVID-19 pandemic produced a sharp reduction in 2020, substantially impacting the number of published scientific papers. The period 2021-2022 has also experienced a decline. However, this is still possible because 2022 is still ongoing. With 303 citations this second time, Jackson's paper received the most attention.

The article, titled 'employability skills development in work-integrated learning: barriers and best practice,' discusses how work-integrated learning (WIL), is becoming more recognized as critical in providing recent graduates with the employability skills required to succeed a professional setting. While much research has been done on the positive effects of WIL programs on students' overall skill development, most of that research has focused on the final product rather than the method by which students acquire vital skills during internships and co-ops. This article examines factors limiting skill performance during WIL and the best strategies for teaching students to develop marketable skills through classroom placement activities. The data for this paper came from a survey provided to 131 undergraduate students participating in various academic disciplines at an Australian university. Most of the student's placement experiences, or the aspects they deemed most important to their learning, align with WIL program best practices. Problems with completing specific placement-related tasks may be attributable, in large part, to shoddy construction. In general, students' experiences and perspectives on the significance of those experiences align with WIL best practices. We investigate the ramifications of our findings for academics and professional practitioners.

This topic's research tendencies are expected to continue to attract researchers. The increased industrial demand for highly skilled personnel necessitates more research on employability skills. Researchers should delve deeper into aspects of work abilities that prospective workers need to enhance. Factors that impede developing job skills can also be employed as research topics. Furthermore, the regulations of various countries make this topic even more intriguing to investigate through research.

4. RESULTS AND DISCUSSION

4.1. Co-authorship analysis

This article is restricted even further to documents in the form of final publishing articles that use English and are published in journals, conference papers, book chapters, reviews, and books. There are 1,070 documents in total suitable for inclusion, given the requirements. With 266 articles (24.85%) of the total, on employability skills, United Kingdom (UK) is a productive country producing research on the subject. In addition, the nations that actively publish on this subject are the United States (US) with 75 documents (7%), Malaysia with 133 papers (12.42%), India with 125 papers (11.68%), and Australia with 187 papers (17.47%).

Figure 3 depicts an international network, showing that the United Kingdom has the most substantial total link strength of all the countries shown there, which is 48. Australia (37), followed by the US (31), Malaysia (20), Canada (13), and India (11) rounded out the top five. The significant impact of the UK's high document output on the total number of citations can be attributed to this factor. According to the data collected, however, citations are not always dependent on the total number of documents that scholars, organizations, or countries created. The United Kingdom has 4,584 papers cited, making it the country with the most citations. Australia comes in second with a total of 3,242 documents. The co-authorship examination revealed the connections between the individuals who had contributed to the publication of the papers. It was shown by the link's degree of strength. Therefore, the overall connection strength indicated one author's total co-authorship strength with the other [45], [72], [73]. Publication links across countries are displayed in Figure 4.

The tendency is due to the marketization of education, job market developments, and public policy shifts. Both have fueled the movement. These include graduate unemployment in a competitive labor market and the so-called "battle for talent" with accompanying skills gaps and shortages [74]. "War for talent" skills shortfalls and poverty are also included. Several studies, including the most recent CBI survey, have revealed that advanced industrialized countries have skills shortages [75]–[77]. Digital innovation has created the demand for new abilities while making others obsolete [78]. These trends have pressured higher education institutions to consider ways to incorporate employable skills into the curriculum. Colleges and universities, as well as government organizations, are increasingly focusing on students' ability to find employment [15], [79]–[81]. Figure 5 displayed a graphic representation of the top 10 publications and nations that publish articles on employability skills.

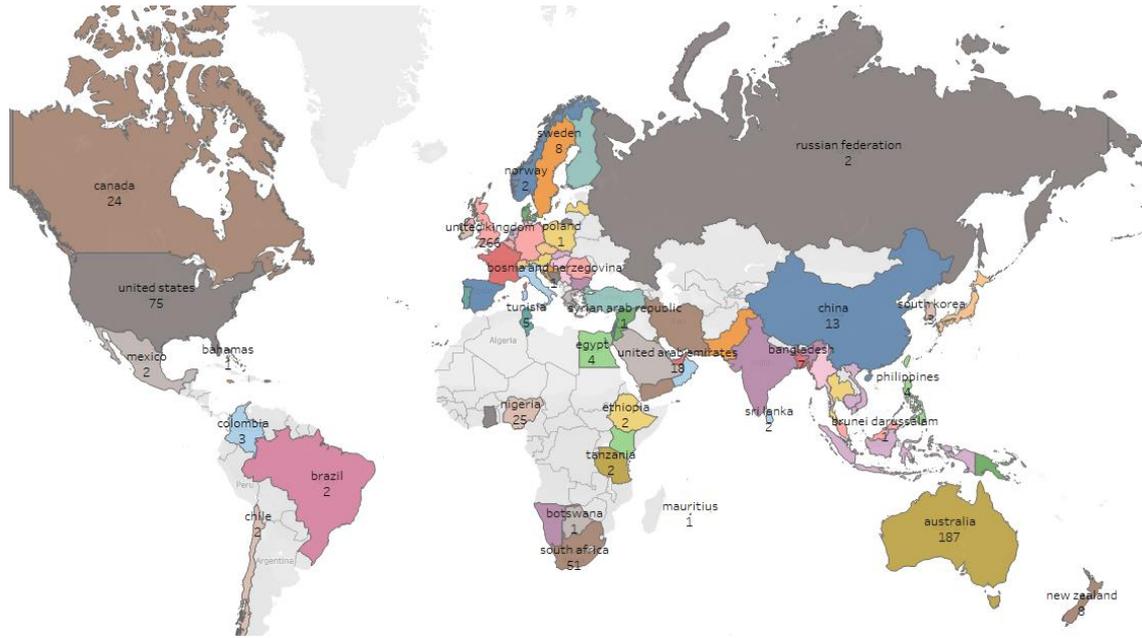


Figure 3. Visualization of countries contributing to the document on research about employability skills

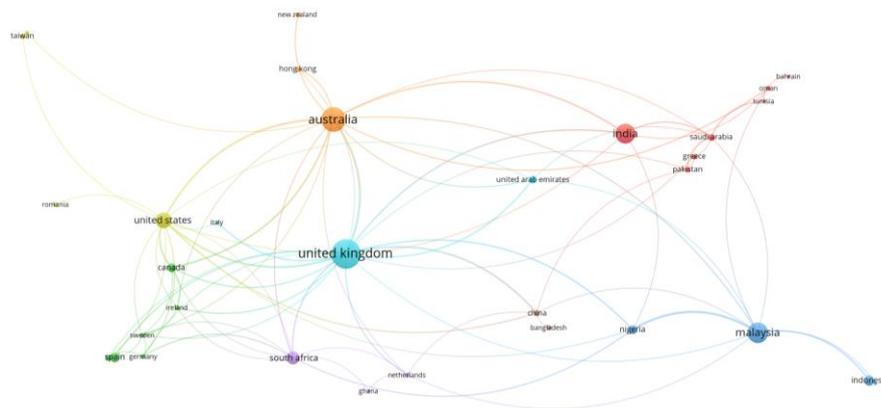


Figure 4. Publication network between countries

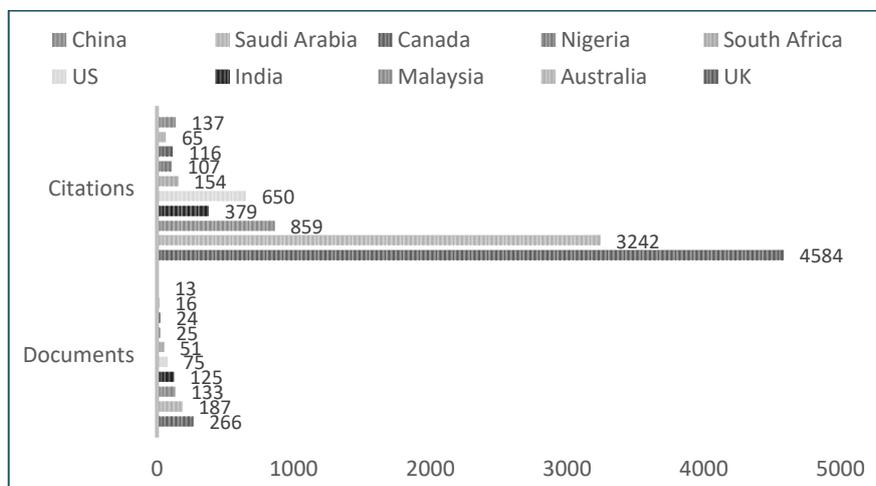


Figure 5. Visualization of the top 10 publication and producing countries on employability skills

We found 1,070 documents with 2,524 contributors working together to publish articles about employability skills. These articles were created through collaboration. On the other hand, just 76 writers (7.1%) have written at least three separate publications. The authors quoted the most are graphically represented in Figure 6. Following Jackson with 968 citations from 14 journals is Wilton with 305 citations from three documents and Riebe with 141 citations from three papers. The author with the most citations overall is Riebe, with 141 citations from 3 articles.

It is possible to explain, using Figure 6, that several writers have produced more than three documents yet have fewer than 65 citations. For instance, Aliu has seven papers but only 20 citations, and Aigbavboa has 10 documents. Both authors have been cited 10 times. It is not a given that there will be many citations concerning the number of documents available. A paper's length, number of references, size of the title, kind of affiliation, and number of authors all have a role in determining the minimum number of citations that should be included. None of these other considerations are related to the scientific value of the publication [82], [83].

In addition, for a considerable amount of time now, the number of citations awarded to scientific work has been regarded as an indication of the paper's quality. Citations are produced when one author acknowledges the work of another author who has previously published on a subject comparable to the one discussed in the current position. Based on previous study, regardless of whether it was positive or negative, you demonstrate that you are familiar with it and that it has influenced the work that you are conducting at present. Citations are essential in communication and scientific evaluation. Most bibliometric indicators place a high value on citations; for example, the impact factor, H-index, and Crown Indicator all place a high value on them. Google Scholar and other academic search engines rank results by mentions [84].



Figure 6. Distribution of the top 10 authors by the number of citations

Consequently, citations are a crucial statistic. Citations measure the impact of research. It allows a more thorough study of authors', journals', and institutions' work. Metrics for a publication's impact, significance, and similarity are typically derived from its primary descriptors by science databases like Web of Science, Scopus, and Dimensions (such as its title, authors, subject matter). Other sources include indexed studies. It helps databases measure how scientists react to new knowledge. These data stores do not save the full text of documents; they keep the information needed to find records and create indicators [85].

Figure 7 shows a visual of the distribution of published documents related to employability skills using a tree map. This bibliometric research discovered 1847 institutions that published articles on employability skills. Only 14 institutions (0.7%) had at least three articles. All the top 10 most productive institutions in this field are from universities in Australia (5), Malaysia (3), Qatar (1), and the United Kingdom (1). The School of Global, Urban, and Social Studies, RMIT, Melbourne, Australia published the most articles and received the most citations (4 documents, 119 citations). Macquarie University in Sydney, Australia, comes next (4 papers, 93 citations). The most often cited article on employability skills is displayed in Table 2.

Table 2 shows the top 10 publications on employability skills. The top 10 papers were published between 2005 and 2016. This information illustrates how this topic of study writing connected to employability skills is evolving. The problem raised by this study is mainly related to job skills. After that is how to strengthen this ability at the higher education level, other publications on the job market, skills development, and employability skills assessment are available.



Figure 7. The most productive institutions publish articles on employability skills

Table 2. Employability skills article with the most citations

No	Title	Year	Cited	References
1	The concept of employability	2005	577	[86]
2	Enhancing graduate employability: best intentions and mixed outcomes	2006	312	[87]
3	Employability skills development in work-integrated learning: Barriers and best practice	2015	303	[88]
4	The student perspective on employability	2013	288	[89]
5	Employability skills initiatives in higher education: What effects do they have on graduate labor market outcomes?	2009	267	[90]
6	Re-conceptualizing graduate employability: the importance of pre-professional identity	2016	158	[91]
7	The impact of work placements on skills development and career outcomes for business and management graduates	2012	141	[92]
8	Graduates', university lecturers', and employers' perceptions towards employability skills	2010	141	[93]
9	Developing employability skills: Peer assessment in higher education	2006	137	[94]
10	Do employability skills really matter in the U.K. graduate labor market? the case of business and management graduates	2011	135	[95]

A survey of the literature (577 references) on the topic of employability skills in the UK is provided. In many countries, including the UK, EU, and others, the concept of “employability” is central to labor market policy. This research examines how the phrase is used currently and in the past. It was utilized as an exploratory idea and policy analysis framework. This article then explains how the notion has evolved and its current position in the job market. The following step is to create a training strategy to define employability. This approach can better inform labor market strategies by moving beyond explanations of employment and unemployment that only examine supply-side or demand-side issues. Recently, the term “employability” has been used by many policymakers, although it has been given several different definitions in academic circles. Abilities and character traits that make a person desirable to potential employers are summed up in this acronym. According to others, this limited usage of the phrase might empty the concept of employability. A comprehensive framework for analyzing employability is provided at the end of the text. This paradigm is based on human factors, personal situations, and external influences, demonstrating the significance of both supply-side and demand-side elements [86].

The second most cited article (312) was from the UK. The Higher Education Funding Council of England commissioned a study to see how focusing on job readiness for higher-education students affected graduates' chances of finding work. The study's findings question frequently held ideas that these skills can be taught satisfactorily in typical school settings. Individual university department data assesses faculty attitudes toward and participation in courses to build employability skills. Despite teachers' best efforts to boost graduates' employability, the plan's inherent limitations mean that their efforts will always produce inconsistent results, it is claimed. Others argue that investing in better opportunities for learning and growing on the job would be a more efficient use of resources. Research shows that graduate employment prospects are enhanced when employers get involved. Assists recent grads in transitioning to the working world [87]. Figure 8 displays the author network on employability skills topic based on the visualization in VOSviewer.

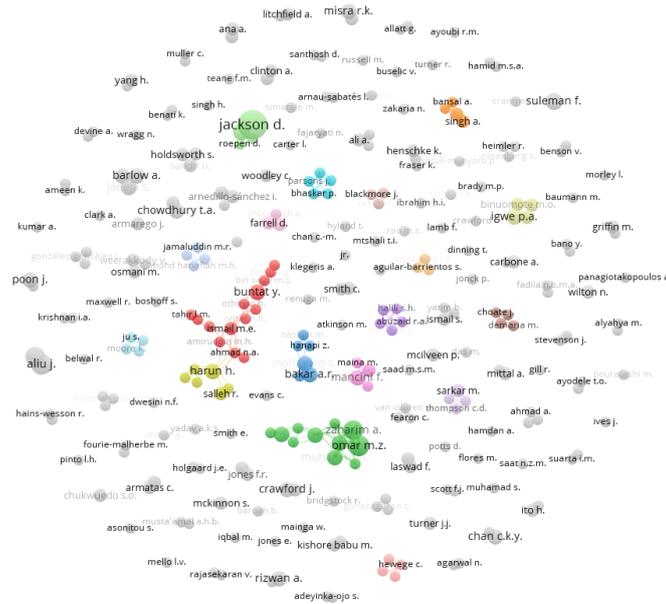


Figure 8. Author network in employability skills topic

Figures 9 and 10 also visually represents the top 10 publications and conferences featuring work skills articles. Journals that publish articles on employability skills form a network, as shown in Figure 9. Journals with numerous connections will have many huge circles representing their prominence. Figure 10 shows the top 10 journals regarding the number of articles published related to employability skills.

When the network between the top 10 papers is examined in further detail, it becomes clear that not all the articles are related but rather through documents authored by other writers. The probable explanation is that not all documents listed in the top 10 cited are connected, but some are. It demonstrates that there is still a tremendous amount of research on employability skills. According to Figure 8, the author with the most publications is Jackson (14 documents). However, the network connecting writers has six total link strength (TLS). Omar ranks first with the highest TLS (7 documents, 26 TLS). These findings suggest that many documents do not always imply many author networks. The picture indicates that the option to work on employability skills research is still highly open. Furthermore, if it is related to Figure 3, collaboration across nations remains open, as there are still few networks between countries that research employability skills.

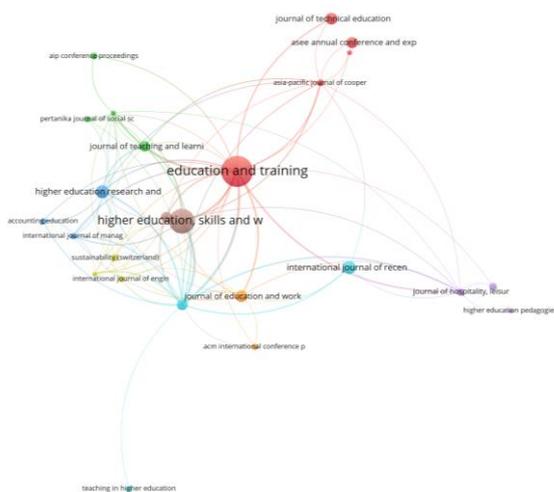


Figure 9. Journal networking

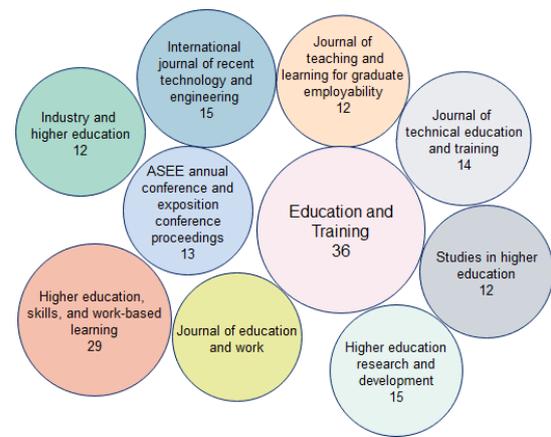


Figure 10. Top 10 journals and conference published employability skills articles

4.2. Co-occurrence analysis

The Scopus database provides scholars access to keywords: index and author. Author keywords are search terms selected by the author of an article to represent its subject matter best. The author is responsible for contributing their keywords to the article metadata. On the other hand, index keywords are chosen for inclusion in the Scopus database by a particular algorithm. This algorithm considers the words in the index and those in the title, abstract, and authors' keywords. In VOSviewer, the keywords can be analyzed in one of three ways: by looking at the index, author, or both types of keywords. This article only utilizes the author keyword when considering that the author carefully picked the author keyword and is the person who understands the article's content best. The index keyword encompasses a broader subject area than the author keyword does [25].

The network visualization of author keywords for research about employability skills is displayed in Figure 11. The result found a total of 3,475 author-related keywords to research. This graphic is revealed after applying a filter considering keywords that have appeared at least once. A keyword's prominence within the typeface visually represents how often it is used. Because it was a keyword used to filter papers in the Scopus database, it is not unusual to see the word "employability skills" appear in large type. The visualization allowed for forming three clusters to depict the network between the keywords derived from the study regarding employability abilities. The study strands related to this topic have been organized into the formed clusters. The emergence of several more specific keywords to a given group demonstrates a pattern observed in the research. This pattern is reflected in each new cluster that is established. We have color-coded each group of keywords according to their respective categories.

The first cluster is red, consisting of 80 keywords. The keyword that appears the most is employability skills. It is followed by employability, higher education, skills, entrepreneurs, soft skills, engineering, engineering graduates, and curriculum, which often appear in cluster three. This study has implications for the realm of education for acquiring job skills. Graduates have access to these opportunities in the labor market, so most of this cluster's emphasis is on fundamentals. The research findings cast doubt on the hypothesis that students might acquire these abilities by paying attention and participating in classroom discussions.

Academics' levels of knowledge about and interest in teaching and skill development at the workplace are assessed through extensive data collected at the departmental level of universities. It is argued that the schedule's limitations will always lead to varying results, despite educators' best efforts to increase graduates' employability. Academics mean well when they try to make their students more marketable to potential employers, but this is where we are. It was also argued that resources would be better spent on bolstering internships, apprenticeships, and other forms of on-the-job training and increasing employer participation in classroom activities. Both were discovered to strengthen recent graduates by improving their opportunities in the job market. There was also a positive correlation between graduates' employment prospects and their time gaining skills and experience on the job [87].

Most high schools teach work skills, despite disagreements about whether they should. Employers claim college graduates lack basic skills for successful employment, even though more people are graduating. Much research has been done to discover why this is the case from the perspectives of government, companies, graduates, and higher education institutions. The viewpoints of academics who have profited from this boost in employability are not frequently recognized. The importance of students' intrinsic motivation and dedication to their studies has been emphasized by learning theorists. The topic of whether undergrads get job skills arises. This article pollutes over 400 business, marketing, and human resource (HR) undergraduates about employability. The findings show little agreement between student and stakeholder perceptions. Why so few students participate in activities designed to improve their employability may be attributable to differences between first-year students, sophomores, and seniors. Several proposals and concepts were made to strengthen higher education [89].

The second is green cluster keywords, with 71 keywords that include students, education, engineering education, curriculum, teaching, and e-learning. It examines attempts to increase work skills. WIL provides newly minted college grads with the practical knowledge they can use in their careers. Although some progress has been made in WIL evaluation, the focus remains primarily on the final product, with little consideration given to how, when, or from whom students acquire crucial skills during work placements. This research draws from successful teaching and learning methods in the workplace and during WIL placements.

This study uses survey data from 131 Australian undergraduates majoring in various fields. What students encounter or feel is crucial to their learning during placement is in line with WIL best practice guidelines. Poor design is to blame for many location difficulties. What students experience during placement or consider vital to their learning aligns with WIL's best practices. We examine the consequences of this discovery [88].

Besides WIL's efforts, there has been great demand over the past quarter of a century. It needs new engineering competencies and progressive curriculum and pedagogy changes that match engineering education demands. It has now reached the point where it is being observed worldwide, including in the United States of America, Europe, Australia, and other regions. There are two primary social concerns to which many engineering schools have developed solutions: the employability of recent graduates and the requirement for engineering to take a more environmentally friendly approach. However, how engineering institutions respond produces a consistent pattern throughout many parts of the content, even though these two societal difficulties and requirements couldn't be more dissimilar. Regardless of the nature of the adjustment, it seems as though three very distinct curricular methodologies have emerged: a gradual strategy, an integrating strategy, or a rebuilding strategy, the latter of which includes a significant reworking of the curriculum. Additional techniques and integration strategies are the ones that are utilized the most frequently.

In contrast, most communities dedicated to engineering education have only just begun to think about how to rebuild. Most technical schools realize that it is difficult to rework their curricula completely. Thus, usually speaking, incremental alterations are favored. In the broader body of research, several concepts, techniques, and institutional responses provide examples of how the curriculum might be altered to address employability and sustainability better. These strategies are based on decisions made by management and academic faculty; however, the implications for using different methods are significantly different regarding system change, the role of discipline, leader intervention, and faculty development strategies. In addition, educational organizations may use various response tactics depending on the program and the semester. It is anticipated that a greater awareness of the intricacies of systemic change will be created because of the conceptual framework offered here, which can provide an analytical anchor [96].

Blue represents the third cluster. It has 34 keywords: learning, human and lifelong learning, employment, and vocational education and training. The articles that make up this group investigate the connection between employable skills, occupational education and training, and learning, both traditional schooling and education, that continues throughout one's life. One of the pieces of writing included in this collection discusses the idea of a skills gap prevalent in the rhetoric around economic reform and urges Australia to become a skilled country. This concept is inextricably tied to the widespread belief that today's youth do not possess the mentalities required to keep up with the demands of the modern economy. However, there is a lack of clarity surrounding the meaning of the term "skill," the nature of the constraints it holds, and the differentiation between "soft" and "hard" talents.

Specifically, there is a lack of clarity surrounding the following: The new job skills framework in Australia does not answer critical questions, even though it lists the characteristics and skills that are assumed to be part of a job-oriented soft skills program. It outlines the factors and dispositional abilities that make up a job-oriented soft skills program. The debate on skills has come under fire because it has brought attention to the fact that promoting soft skills as measurable competencies has contributed to an ambiguous and imprecise sector. This critique is about a generation of young people reorienting themselves toward a professional path focused on commerce. Life skills and attributes are the so-called job skills acknowledged in the new framework. Nonetheless, they still have labeled job skills. Consequently, it has been proposed that they should not be confined to vocational education but instead be considered the liberal arts tradition of education [97].

Articles highlighting the role training plays in boosting employability skills are also included in this cluster. In a dynamically shifting global economy, job skills are rapidly becoming the primary focus of institutions that provide vocational education and training. This study investigates the relationship between academic specialization, student background characteristics, and industrial training related to developing job skills through competency-based education and training. There seems to be a strong correlation between the academic disciplines and business activity when it comes to acquiring the knowledge and abilities necessary for success in the workplace. There is some circumstantial evidence to imply that pre-education affects the acquisition of occupational skills; however, no such association was found between gender and the addition of skills. The findings point to the necessity of an academic field to define the specific work skills required for social and community practice to improve employability skills development in training programs. This requirement is highlighted because no such field exists [98].

Network visualization can be described as an overlay visualization, as seen in Figure 12. The overlay graphic depicts the trend of research with these keywords over the previous five years from the bibliometric analysis period chosen. The blue nodes (2015-2017) reflect popularly or often used terms, while the yellowish nodes (2019-present) describe the trend or popularity of newer research that many other scholars have not done. According to Figure 12, there are various recommendations for further research on areas connected to developing employable skills. Based on the results of the overlay visualization from VOSviewer, several themes might be used as study trends. These are novel topics in this discipline that could be researched further. Figure 13 depicts prospective study themes in this field.

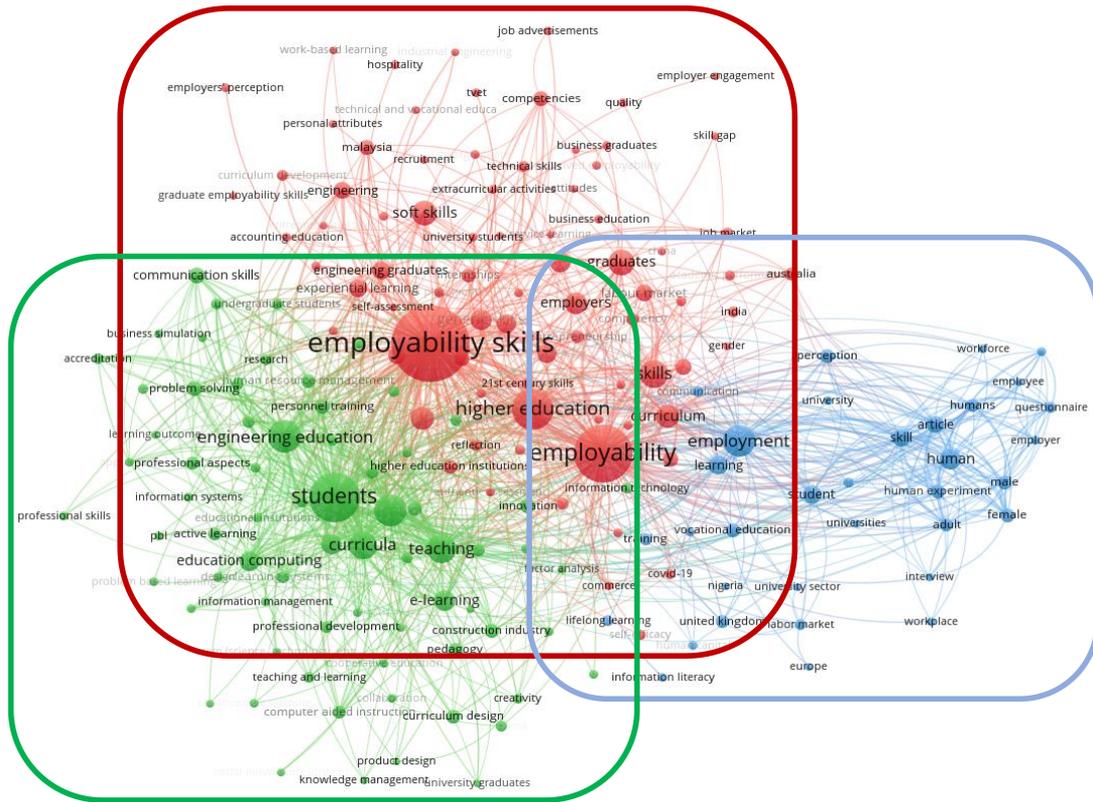


Figure 11. Network visualization for keywords in employability skills research

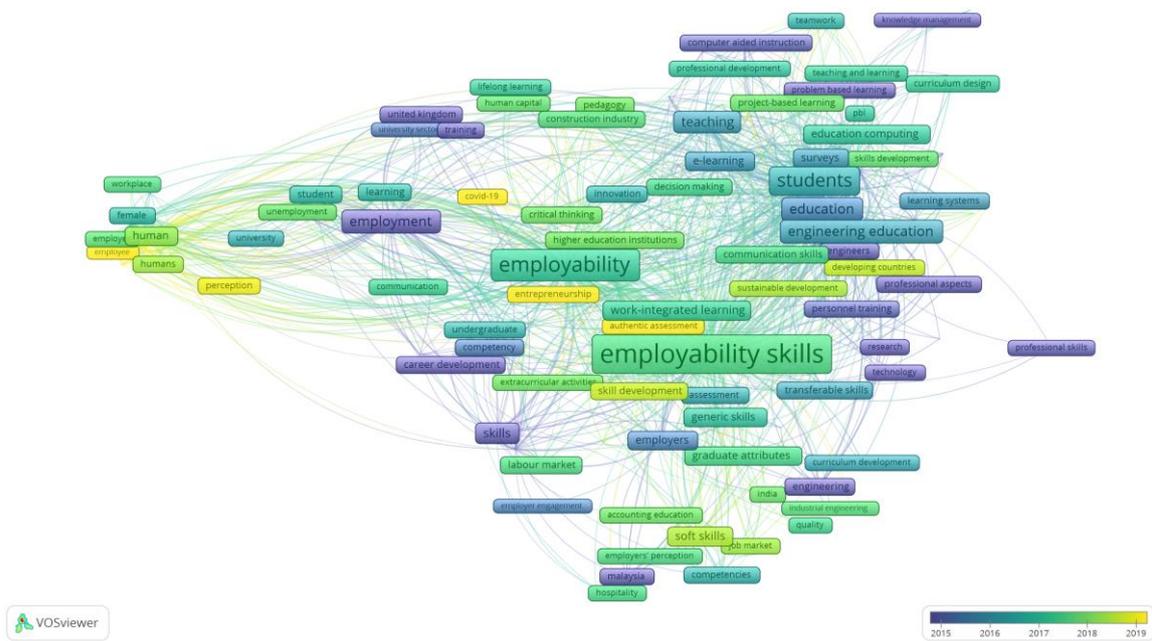


Figure 12. Overlay visualization for keywords in employability skills topic research

Figure 13 (a) shows how science, technology, engineering, and mathematics (STEM) is understudied. Only 12 Scopus papers link employability skills and STEM. One study demonstrates how educational institutions aim to educate graduates for jobs. Determine the STEM employment skills employers need. Help STEM schools build job-skills-focused programs. Based on responses from 250 human resource

(HR) managers across five US regions, this study analyzes the importance of 16 different skills for success on the job (Northeast, Midwest, Southeast, Western, and Pacific Mountains). All 16 industrial talents are rated highly. Teamwork, self-motivation, verbal communication, and problem-solving were also highly valued. This document helps STEM educational institutions' internal and external stakeholders analyze curricula and programs and reduce the gap between graduate competencies and workplace needs. This study bridges STEM education and HR manager-recommended employment skills. This research focuses on STEM schools in the US, but it is relevant to STEM schools worldwide that prepare the next generation of professionals [99].

Figure 13 (b) demonstrates that the article hardly touches upon the experiential learning concept. One article on this issue that has become a reference explores the role of experiential learning in developing employability skills. This research aimed to determine if and how recent graduates' and new workers' job skills improve because they participate in experiential learning (E.L.) activities and if they are happy with the results. After reviewing the available research, four hypotheses were developed regarding E.L.'s ideas, job skills, and learner satisfaction. According to the results, E.L. is linked favorably to job-related skills and learning enjoyment. It was found that employment skills mediated the connection between E.L. and graduate students' happiness with their education. The findings of this study will help hospitality graduates advance in their employment and demonstrate the quality of the university's hospitality department [100].

The association between employability skills and 21st century abilities is depicted in Figure 13 (c). The network also demonstrates the relevance of engineering and higher education in enhancing employable skills in the 21st century. In one piece, the emphasis is on work skills and their appearance in higher education studies. Competencies, abilities, qualities, and skills are critical because they influence how successful university graduates are in their careers. Since the 1980s, there have been numerous techniques and frameworks for various certifications, ranging from 21st century talents to more recent critical skills required in education for sustainable development. The United Nations, the European Union, the Organization for Economic Cooperation and Development (OECD), and other international organizations frequently devise large plans to assist professionals and specialists willing to take on new challenges in meeting the urgent needs of an ever-changing economy and society [101].

Figure 13 (d) examines university students, curricula, and e-learning concerning employment abilities. The current economic climate has lowered the value of traditional college education, making it more necessary than ever for students to learn skills that will help them advance in their careers. Finding and processing data, communicating with others, organizing and solving problems, promoting professionalism, and engaging with others are all required skills for the workplace. The University of Luton has created initiatives to integrate the development of these competencies into all departments' pedagogy. The primary purpose of this initiative is to develop standardized formats for describing the necessary background knowledge for each introductory-level course. Initial responses to the results of the Luton strategy are included in this article [102].

Figure 13 (e) shows how curriculum and work-based learning boost employability. This study examined employers' judgments of undergraduates' employability in three areas: personal qualities, core competencies, and topic knowledge. Further comments and ideas will be considered. According to employers, employability skills are essential. Understanding the material, fundamental abilities, and character traits were paramount. Developing positive character traits like accountability, self-assurance, self-control, social competence, a positive outlook on work, a disciplined work ethic, a sense of purpose, and the ability to manage one's own time were also emphasized. Courses relate to industrial demands and organizations [103].

Figure 13 (f) depicts a yet understudied keyword, namely technical and vocational engineering and training (TVET). One article discusses the high rate of youth unemployment in Malaysia. Malaysia's economy suffers as youth unemployment rises. The unemployment rate among young people with postsecondary degrees is shockingly high because of their inexperience, ignorance of the job market, and lack of transferable skills like good communication. TVET is critical in solving the issue of employability. This research aims to build a model to predict engineering technology students' employment in Malaysia. The multinomial logistic regression method was utilized. High-level employability characteristics were discovered using this methodology. Two hundred four engineering technology students from nine technical institutes joined in this research. SPSS version 22 was used for multinomial logistic regression analysis. Technical institutes may utilize the data to estimate future engineering technology students' employability. This article proposes a solution to TVET graduates' problems. The predictive model can discover missing factors in invention programs to reduce unemployment among engineering technology graduates who go on to work in TVET. This research also fills a need in TVET graduate research [104], [105].

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