

Beyond technical know how: A bibliometric study of future soft skills

Vandana Kumari *

Balvinder Shukla †

Taranjeet Duggal §

Amity University

Noida

Uttar Pradesh

India

Abstract

Background: To encourage economic and social progress, it is crucial to develop human capital and associate skill sets with job requirements. Due to the shift in necessary competencies and abilities, there is a discrepancy between what businesses demand and the professional profiles that are accessible in the labor market. COVID-19 has been the catalyst in accelerating the pace of change and affecting the job market. This has led to huge demand for upskilling and reskilling.

Design/methodology/approach: A thorough study was carried out on 127 articles obtained from the SCOPUS database. These articles were collected by searching for the keyword “future skills” in Scopus. The study employed bibliometric techniques, to present a comprehensive view of future skill research, encompassing performance analysis and science mapping.

Findings: The findings indicate a recent surge in research focused on future skills, and countries like United states and United Kingdom leading in this area. However, there remains ample room for further investigation, as outlined in this study. The majority of research on future skills is primarily associated with social sciences, business, management, and accounting disciplines.

Originality/value: This paper stands out due to its pioneering approach in offering valuable insights into the present state of research on future skills. Additionally, by employing bibliometric analysis, it offers recommendations for potential future paths.

Subject Classification: 62B10, 90B50, 90B70, 9401, 97B40, 97M20.

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* E-mail: vandana@s.amity.edu (Corresponding Author)

† E-mail: bshukla@amity.edu

§ E-mail: tduggal@amity.edu

1. Introduction

The workforce throughout the world has realized the importance of having the proper skills for the right job. Beard et. al. (2008) defined skill as “the ability to perform a job in a certain way, with correctness, and extraordinarily quickly.” The word refers to “the capacity arising from knowledge, participation, and accuracy to build a desired thing,” according to Ritter et. al. (2015)’s definition. According to Tang (2020), the word “Competence, which is the outcome of information and expertise, is what allows a person to contribute successfully to their primary role. Consequently, it mixes many inputs and abilities that are learned and developed via formal education and hands-on experience”.

Since they may be learned and improved via focused training, they are referred to as skills. Soft skills, also known as transversal competencies, are task-related rather than person-related since they are applicable in all situations. Having Soft skills are essential for the transferability of talents to other activities and certify certain professional behaviours. In this regard, the World Economic Forum 2020 highlighted the 10 soft talents listed below as being in high demand by businesses by 2025: active learning; analytical thinking and innovation; complex problem-solving and learning techniques; resilience; originality; flexibility; stress tolerance; creativity and initiative; social influence; leadership; ideation and reasoning; emotional intelligence; problem-solving; technology design and programming.

The “future of Jobs” reported an outlook on transforming the employment landscape in India. The Primary forces such as globalization, demographics, and Industry 4.0, make an impact on the key sectors of the economy and provide a consolidated view for the students, Higher education system, Industries, and policymakers. The rise of technology is compelling companies to shift their operational approach from relying heavily on human labour to embracing a technology-focused mindset (Malisetty & Sowmya, 2022).

Structural changes impact labour markets, causing disruptions in the equilibrium between skill supply and demand. While misalignment is normal over the business cycle, the costs of persistent mismatches can be considerable if left unaddressed: they limit the ability of firms to innovate and adopt new technologies while impeding the reallocation of labor from less productive activities to more productive ones (Adalet McGowan and Andrews, 2015).

EY report explains 37% of deployment in jobs that have radically changed skill sets. The pace of automation and scope is growing exponentially. As almost major work activities get increasingly automated, it has diverse implications on the global economy- varying nature of work, re-defined job roles, and a certain class of job roles becoming obsolete leading to growth in new roles and new jobs. This evolution is forwarding to a new age of learning- agile, continuous, and on-the-go, both essential and demanding for the current workforce and the emerging pipeline of talent. Additionally, it prompts the question -What jobs are becoming automated? What consequences will it have on the employees and the organization? Which novel talents will be demanded in the future? How should people change to remain pertinent in the future?

Researchers are increasingly reporting the demand of workplace skills. Technological intervention has changed the working approach for entire working units (Saxena, Bagga, & Gupta, 2021). There is a scarcity of studies Therefore, the current study represents a positive advancement by aiming to provide an in-depth review of literature on future skills from 2015 to 2023, employing bibliometric analysis as the methodological approach. The study brings attention to significant themes and notable research objectives, and it will concentrate on the following research inquiries:

1.1 Research Questions

The study aims to answer the following research questions:

- (1) What is the current state of research on future skills, including an examination of influential authors, publication trends, top publishing countries, and subject areas of study?
- (2) Which research paper has the highest influence in the field of future skills?
- (3) What are the prevailing themes in research on future skills?

2. Literature review

2.1 Higher Education in Industry 4.0

The entire globe is undergoing a revolution, but not this time as a result of advancements in science or alterations in governmental regulations (Chaudhry & Mittal, 2022). Industrial revolution and digital disruption have affected the workplace skills that led to reskilling and

upskilling of the workforce. The changes in work tasks in industries is provoking a shift in the required skills and qualifications of the human workforce (Karre, Hammer, Kleindienst, & Ramsauer, 2017). Industries face challenges in developing skills and competencies of their employees regarding e.g., problem-solving skills, analytical skills, resilience, and adaptability (Schuh, Gartzen, Rodenhauser, & Marks, 2015). With technical skills, the demand for soft skills has also gained importance after the Covid pandemic. Social skills, Teamwork abilities, communication skills, problem-solving skills are required by the industries. It seems obvious that the temporary suspension of HEIs' face-to-face activities has significantly hampered their ability to operate everywhere in the world (Sahoo, Muduli, Luhach, & Poonia, 2021). Higher Education systems need to prepare and bring out the industry ready workforce. Interdisciplinary and hands-on training approach would be suitable for future working environments. In order to prepare students for the evolving workforce, 21st century frameworks provide strategies to identify the necessary skills. As a result, higher education systems need to analyse and reform their curricula accordingly to meet these requirements (González-pérez & Ramírez-montoya, 2022).

3. Methodology

3.1 Bibliometric Analysis

Bibliometric analysis assists in exploring, organising, and analysing a substantial research collection from a quantitative, objective standpoint to assess the development of literature and scientific calibre in a given field (M., Alicia, Norat, & Domingo, 2015). With the use of this approach, a researcher may analyse earlier scientific research, comprehend how knowledge has advanced over time, and identify promising areas for future study (Albort-Morant, Jorg, Antonio, & Gabriel, 2017). The researcher focuses on the bibliometric analysis of the future skills required by the organizations in the VUCA environment. As technology disruption is seen around the globe, not only technical skills but the demand for soft skills have also become increasingly important.

Bibliometric techniques employed in this study to answer the research questions were:

- (1) Performance analysis- It is a scientific mapping that reviews the performance of different research components of a particular field.

(i.e., authors, countries, journals, institutions, citations) (Naveen, Satish , Debmalya, Nitesh Pandey, & Lim, 2021).

- (2) Science Mapping- Science Mapping is a valuable technique that utilizes various methods such as bibliographic coupling, co-word analysis, citation analysis, and co-authorship analysis to examine the bibliometric structure and intellectual structure of a research subject. When combined with network analysis, these methods help reveal the connections and relationships within the scientific landscape.

To aid in the visualization and clustering of data, the study mentioned by Naveen, Satish, Debmalya, Nitesh Pandey, and Lim (2021) employed VOS viewer software. This software offers a range of analytical tools, including co-citation analysis, which further enhances the understanding of the research domain.

3.2 Data Collection

In the process of data collection, this research employed specific keywords and constructed search strings to identify relevant articles. The Scopus database was chosen as the suitable database for this study. A keyword search focused on “future skills” was conducted, resulting in the retrieval of 352 documents. The timeframe for retrieving research papers was set from 2015 to 2023, as there were limited studies conducted before

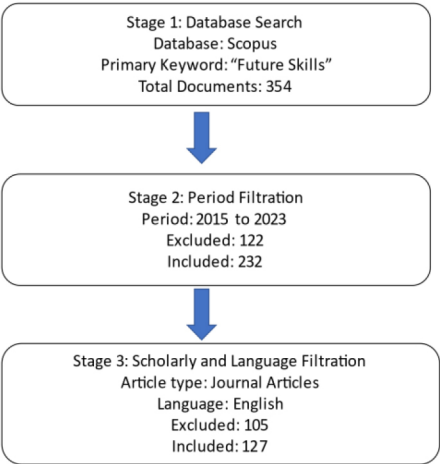


Figure 1
Systematic approach of literature selection

2015, and a notable increase in the study of “future skills” was observed from 2017 onwards.

Data collection took place in March 2023, and it’s important to note that the Scopus database regularly undergoes updates, which may lead to variations in the results in future. To refine the search, the inclusion criteria included journal and review articles written in the English language. This filtering process yielded a final list of 127 research papers, which were then subjected to bibliometric analysis. Figure 1 and Table 1 provide visual and tabular representations of the collected data, respectively.

Table 1
Keyword search string

Keyword Protocol	127 Documents extracted
TITLE-ABS-KEY (“future skills”) AND (LIMIT TO (SRCTYPE, “j”)) AND LIMIT-TO (LANGUAGE, “English”))	

4. Analysis & Findings

4.1 Performance Analysis

An analysis was conducted to examine publication trends in future skills research. This analysis considered factors such as publications and citations, categorized by author, year, journal and country. The objective of this analysis was to address Research Question 1 (RQ 1) of the study, which focused on understanding the current publication trend in the field of future skills.

4.1.1 Publication by year

Figure 2 illustrates progression of the literature concerning future skills study between 2015 and 2023. Notably, starting from 2017, there has been an upward trend in research activity within this domain with the research intensifying in recent years. The increase in future skills study is likely attributed by the influence of industry 4.0 and the VUCA (Volatile, uncertain, Complex, and Ambiguous) environment.

4.1.2 Countrywise Publications

A country’s contribution to specific research can be gauged by the number of documents it publishes and the total citations it receives. Table

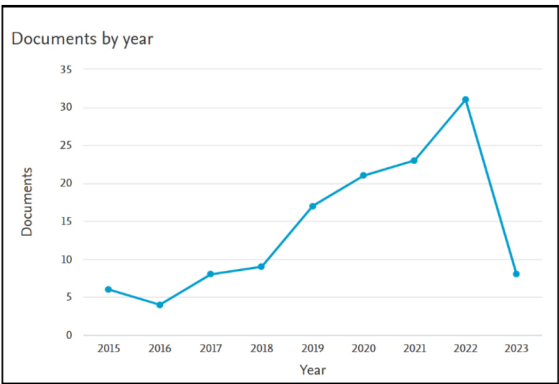
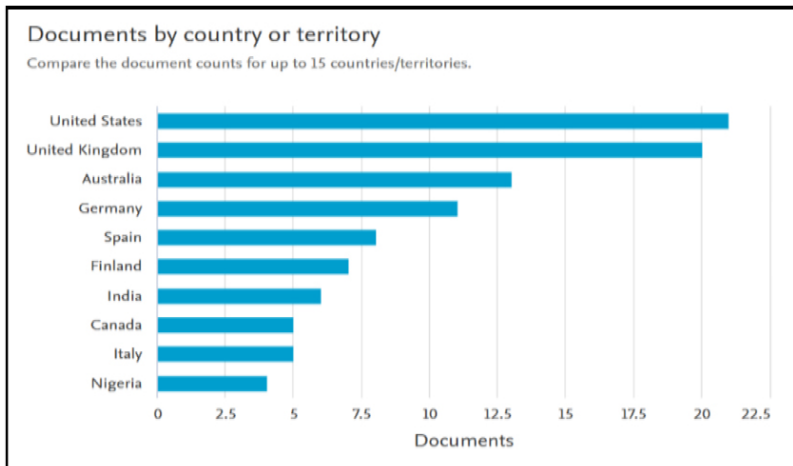


Figure 2
Growth of Literature over time (Scopus)

2 provides rankings for the top 10 countries in terms of productivity in future skills research, based on total citations and total publications (Figure 3). The United States emerged as a leader, having the highest number of research papers published (21), followed by United Kingdom (20), Australia (13), Germany (11), Spain (8), Finland (7), India (6), Canada (5), Italy (5) and Nigeria (4).

Table 2
Top 10 highly productive countries in future skills research(Scopus)

Rank	Country	Total Publication	Total citation
1	United States	21	107
2	United Kingdom	20	109
3	Australia	13	104
4	Germany	11	124
5	Spain	8	134
6	Finland	7	41
7	India	6	18
8	Canada	5	30
9	Italy	5	23
10	Nigeria	4	5

**Figure 3****Publications by country [Source: Scopus]**

4.1.3 Most influential research papers on future skills

Highly cited papers (Table 3) are considered more influential than the less cited documents on research area (Merigó, Cancino, Coronado, & Urbano, 2016). Through citation analysis, this study unveils the most influencing articles Research Question 2 (RQ 2) in the field of future skills, determined by their total citation count. Table 4 highlights the top 10 articles with the highest number of total citation counts, acknowledging their significance in the domain.

Interestingly, the highest cited paper (79) titled “The benefit of repetitive skills training and frequency of expert feedback in the early acquisition of procedural skills” is from the medical field which highlights the necessity of future skills training to the medical students for clinical procedures. While the second highly cited paper with 41 citations titled “A guide for the food industry to meet the future skills requirements emerging with industry 4.0” mentions the dynamics of industry 4.0 that has introduced the demands of new professional skills required for the professionals of food industry.

Almost all the domains are facing the rise in demand for skills and competencies. This paper explored the extant literature on future skills. The table also shows that researchers are sensitive towards the change in job market and hence are reporting the skills that will be mostly in demand in future.

Table 3
Top 10 most cited research papers on future skills (Scopus)

Rank	Title/Year	Journal	Citations
1	The benefit of repetitive skills training and frequency of expert feedback in the early acquisition of procedural skills (2015)	BMC Medical Education	79
2	A guide for the food industry to meet the future skills requirements emerging with industry 4.0 (2020)	Foods	41
3	Clashing institutional interests in skills between government and industry: An analysis of demand for technical and soft skills of graduates in the UK (2017)	Technological Forecasting and Social Change	32
4	Development and Initial Validation of a Perceived future Employability Scale for Young Adults (2019)	Journal of Career Assessment	29
5	Flood Vulnerability, Local perception and gender judgement using multivariate analysis: A problem-based “participatory action to Future Skill Management” to cope with flood impacts (2017)	Weather and Climate extremes	28
6	The digital skills divide evidence from the European tourism industry (2021)	Journal of Tourism Futures	22
7	Components of Education 4.0 in 21 st Century Skills Frameworks: Systematic Review (2020)	Sustainability (Switzerland)	20
8	Pedagogies of Preparedness: Use of reflective journals in the operationalisation and development of anticipatory competence (2015)	Sustainability (Switzerland)	20
9	Skills needs of the civil engineering sector in the European Union Countries: Current situation and Future trends (2020)	Digitally engaged physicians about the digital health transition	19
10	Digitally engaged physicians about the digital health transition (2020)	PLoS ONE	19

4.2 *Performance Analysis through science mapping*

A thorough analysis of future skills research was carried out in the preceding section of the paper. This section undertakes science mapping to support and strengthen the performance analysis by exploring the structural and dynamic aspects of a research area (Cobo, López-Herrera, Herrera-Viedma, & Herrera, 2012). In this context, as an element of technique of science mapping, our study employed keyword co-occurrence analysis to examine the relationships between keywords used in the research.

4.2.1 Keyword co-occurrence analysis

To respond to the third research question, the study conducted an analysis of keyword co-occurrence. The justification for performing author keyword analysis provides a representative sample of literature focused on a specific research topic. Figure 4 showcases a density diagram illustrating the co-occurrence of keywords. This diagram was generated using Vosviewer and is drawn on the specific variables extracted from reliable database. The following map indicates the “future skills” is most preferred keyword among the authors (24 occurrences), “skills” (12 occurrences), industry 4.0 (11 occurrences), higher education (6 occurrences). The majorly occurred keywords are depicted in Table 4. The insights obtained from the keyword co-occurrence analysis conducted using VOSviewer software offer valuable information regarding the concepts investigated in the previous research on future skills. Firstly, the concept of future skills has been studies along with the other topics

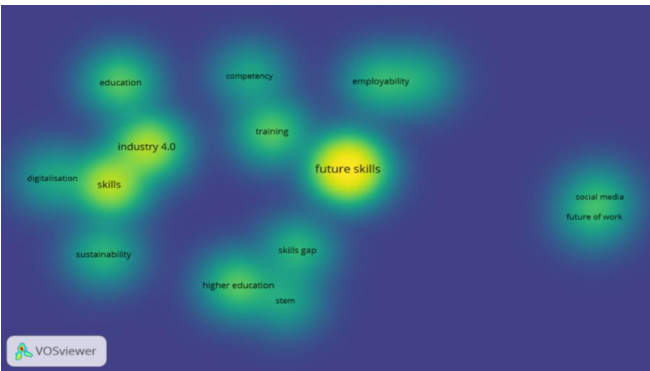


Figure 4
Density diagram of keywords co-occurrence.

Table 4
Top 15 keywords with the frequency of their occurrence

Keywords	Occurrences
Future skills	24
Skills	12
Industry 4.0	11
Higher Education	6
Training	6
Education	6
Sustainability	4
Skill gap	4
Employability	4
Skill development	3
Digitalisation	3
Future of work	3
Competency	3
Stem	3
Social media	3

such as training, skills development, future skills, employability, competency. Secondly, researchers have displayed keen interest in examining future skills within the context of these prominent variables explored in the existing studies, namely, digitalisation, education, industry 4.0, skills, sustainability. Thirdly, higher education and stem are important aspects for bridging the skills gap.

5. Contribution and Discussion

The research offers a comprehensive overview of the future skills study through a meticulous bibliometric analysis. Its primary objectives include organizing the fragmented literature on the future skills and establishing a framework for forthcoming research in the field. Notably, this study is pioneering endeavour of its kind on this subject, and its noteworthy contributions are outlined below: In the first part, current status of research on future skills was analysed. The investigation revealed that studies on future skills date back to 2015, and in recent years, the domain has experienced remarkable growth, with the highest number of research publications observed in the year 2022. Due to the industrial revolution and digital disruption in the world, skill gap has emerged in the workplace. Training, reskilling and upskilling of workforce has become

part and parcel of the companies. Higher Education System is imprudent as they need to reform their curriculums and provide such training to students, so that they become industry ready. Upon examining the regional contributions to research on future skills, it is evident that the United Kingdom and United states has demonstrated a substantial presence in this domain. This may be because United States and United Kingdom has a highly advanced technology and highly skilled labour market.

Keyword co-occurrence analysis identifies popular themes within future skills research. The analysis revealed that the keyword “future skills” was prominent and frequently appeared alongside related topics such as “industry 4.0”, “higher education”, “training”, “employability” and “skill gap”. The authors suggest that higher Education system must incorporate the required skills in their curriculum, and to cultivate future skills among students, it is crucial to harmonize technological, pedagogical, and disciplinary elements with emerging methodological approaches (González-pérez & Ramírez-montoya, 2022).

6. Scope for future work

As per our knowledge, this is the first research based on bibliometric analysis to provide a general spectrum for the future research in this domain. The identifies methodological gap in this study indicates a lack of qualitative and mixed-method research with the realm of future skills. Since skills and competencies for all sectors has changed over time. Almost every sector has seen a disruptive change due to the industrial revolution and efforts should be made to enhance the skills of employees and equip them for forthcoming employment opportunities. Even the COVID-19 pandemic has hit the job market, that accelerated the demand of new skills and competencies. The Global Industry reports are much more sensitive towards the domain as compared to the academicians; thus, researchers need to explore more and report the skill sets which will be in demand for the future workplace.

7. Implications

The study’s findings carry implications for stakeholders across various domains or backgrounds, Employers, Employees, educators, and government. As digitalization and industrialisation has altered the way of working, it has become important to readjust the essential skills needed to access a job position.

The Education 4.0 framework should encompass a comprehensive approach to skills development, encompassing both hard skills and soft skills, for both students and teachers. It is essential to devise strategies for equipping classrooms, providing relevant technological infrastructure, and offering digital resources in alignment with this objective (González-pérez & Ramírez-montoya, 2022). More research is needed in this domain to facilitate the upcoming generation with the skills and competencies required for the future.

8. Limitations

The analysis presented in this study is based solely on academic publications sourced from the Scopus database. Other databases may contain equally valuable research articles on future skills, but they might not be included in the Scopus list. Therefore, it is important to note that this study may not encompass all equally significant references. Additionally, the inclusion of only English language articles may result in the non consideration of works by other language speaking researchers. For simplicity in results presentation and to prevent analysis that is overly complicated, this study has chosen only a small number of indicators for the analysis. The scientific mapping available through VOS viewer, however, could have somewhat mitigated this restriction. Nevertheless, there may be other related concepts that could have been explored but were not covered in this study.

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