

A bibliometric analysis of research on ‘future of work’ and its impact on skills needed for jobs

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Abstract

The ‘future of work’ is a concept that has been used to describe the era of rapid automation and adoption of advanced technologies in industries and businesses. This ongoing advancement has resulted in concerns around job displacement, skill obsolescence, increased income and gender disparity, and how human and artificial intelligence would co-exist and shape the world. Although several research studies have explored these aspects in isolation of other factors, no attempt has been made to comprehensively map the research field so far. In this paper, we conduct a bibliometric analysis of 205 papers which appear in top business, economics, and management journals from 2000 to 2022. Biblioshiny, a web-based application included in the Bibliometrix package was used for the purposes of analysis. The software helped identify influential journals, authors, countries, articles, and themes. Additionally, network analysis helped map the conceptual, intellectual, and social structure of the shortlisted papers. We further develop a future research agenda for understanding technological change and ensuing labour market, skill set shifts. This paper and its findings

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contribute to the literature by offering a scientometric and systematic way to review 'future of work' and its impact on employee skill needs.

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1. Introduction

International institutions such as the World Economic Forum (WEF), Organization for Economic Co-operation and Development (OECD), World Bank have forecasted extensively talked about the 'fourth industrial revolution' and the arrival of the 'future of work' (Alejandro Lavopa & Michele Delera, 2021; International Labour Organization, 2021; World Bank, 2019; World Economic Forum, 2017, 2020a).

The McKinsey Global Institute (MGI), World Bank, and WEF initially highlighted the structural changes happening to the nature of work nearly a decade ago (James Manyika et. al., 2012; World Bank, 2019; World Economic Forum, 2017). More presciently, authors (James Manyika et. al., 2012) predicted the long-range factors that were also at play which would go on to impact and shape the workplace even a decade and half later.

We are living in an era where technologies like Big Data Analytics, Artificial Intelligence (AI), cloud computing, Internet of Things (IOT), Robotic Process Automation, 3-D printing are creating opportunities, improving productivity, giving rise to new and altered jobs, and overall fostering a greater interaction between humans and machines (James Manyika et. al., 2012; World Bank, 2019; World Economic Forum, 2020b).

This fourth industrial revolution, driven by increased automation of routine tasks and use of digital technologies, has disrupted established ways of working and upended existing business models—think e-commerce and digital trade, connected machines and devices, biotechnology, and robots (Er, 2013).

While this transformation plays out in the technological and manufacturing realm, its most significant impact will likely be on the workforce and workplace that is adopting these technologies and rapidly adapting to it as well to keep pace with the changes (Malisetty & Sowmya, 2022; World Economic Forum, 2020a). A MGI study estimated that digital technologies would be the biggest factor in the economic productivity growth (Marco Dondi et. al., 2021)

Previous shifts in skillsets needed by workers in response to technological progress would manifest over decades, if not centuries. Technological change makes it harder to anticipate which job-specific skills will thrive and which will become obsolete in future (Malisetty & Sowmya, 2022).

Bibliometric Analysis

Bibliometric analysis is the analysis of literature in a specific area using mathematical and statistical methods. Bibliometric analysis studies rely on these methods to examine a large dataset of research articles, uncover patterns in the published literature, and study and map published literature in the domain.

The analysis is objective in nature, generated by the scientific method, and examines metrics such as number of citations and publications, co-citations, and occurrences of keywords and topics.

Through this analysis, substantive number of existing research papers can be analyzed for their conceptual, intellectual, and social structure. Further, basis the co-cited relationship of the papers, bibliometric techniques can identify the research themes and research trends.

Research Questions

1. Which are the influential journals and authors in 'future of work' and its impact on jobs and skills?
2. What are the broad themes in research around this subject?

This paper addresses these research questions by focusing on the following research objectives:

1. To uncover trends or patterns of research development in future of work and its impact on jobs and skills
2. To evaluate and summarize the knowledge structure.

Research Methodology

The first step in the research analysis for this study is identifying the database and constructing the dataset based on defined search criteria. Setting the search criteria starts with creating a keyword string comprising multiple terms to conduct a comprehensive search across published research (Moher, Liberati, Tetzlaff, Altman, & The Prisma Group, 2009).

1.1 *Constructing the database/ Data Collection*

The first step in the bibliometric analysis was to identify and prepare the database for this study. Given that ‘future of work’ is a recent construct, the Scopus database was chosen to identify research literature on the subject. To construct the database, the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) method developed by Moher et al was used. PRISMA outlines four key steps to select publications from a database, namely identification of studies, screening, eligibility, and inclusion. (Moher, Liberati, Tetzlaff, Altman, & The Prisma Group, 2009)

The initial search results from Scopus database yielded 377,897 results for search conducted on 25th February 2022. The next step was the screening stage, where different screening criteria were used on these results. First, the results were filtered for papers in the subject areas of Business & Management and Economics. This retained a total of 36,654 papers which were further filtered to limit to articles, conference papers, reviews, book chapters, and book. The last two were included given the relative recency of the subject and the author having come across some book chapters with relevant information. After filtering for articles in English language and source as journals only, a total of 26,688 papers remained.

This resulted in 4019 shortlisted articles, which were then limited to a time-period of articles written in year 2000 onwards Table 1. This period was selected because since the year 2000 the ideas of digitalization

Table 1
The search string and keywords

Keyword String 1 <i>Keywords related to variable 1</i>	future of work" OR "workplace of future" OR "future of employment" OR "industry 4.0" OR "technology" OR "digitisation" OR "digitization" OR "automation" OR "digital transformation" OR "digital economy" OR "computerization"
Keyword String 2 <i>Keywords related to variable 2</i>	"emerging skills" OR "reskill" OR "future skills" OR "competencies" OR "training" OR "retooling" OR "capabilities" OR "L&D" OR "learning" OR "development" OR "jobs" OR "skill demand" OR "wage" OR "occupation"
Keyword String 3 <i>Denotes relationship</i>	"effect" OR "influence" OR "impact" OR "response" OR "attitudes"

and computerization, how it impacts work and workers, has begun to be studied and discussed.

This brings us to the inclusion step, where a total of 2895 articles between the time-period of 2000—2022 were then exported as a .csv file from Scopus for further analysis.

2.2 Bibliometric Analysis Tool Selection

Popular tools for this type of analysis include BibExcel, VOSviewer, CiteSpace, Histcite (Donthu et. al., 2021). After reviewing the different software tools available, the authors selected Biblioshiny for this study (Moral-Muñoz et. al., 2020) since it eases the process for researchers who may not be adept at writing complex programming codes to conduct mapping analysis.

Descriptive Analysis

Through visualization analysis, we have gathered the hot topics and current research frontiers in this area.

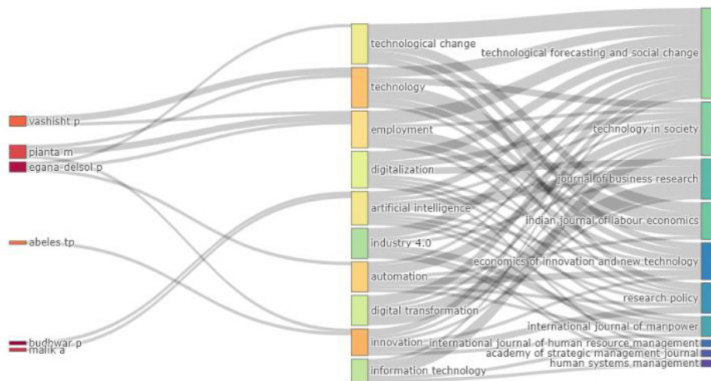
3.1 Information about the data

Based on metadata about the information analyzed in all, 205 articles were analyzed. A majority of these (200) are articles and remaining 5 are review papers. They belong to 33 different journals and were published between the year 2000 and 2022 (upto February 2022).

On average, each of these documents cite 31 articles and in all, more than 12,600 references were analyzed. The number of keywords used is 3.5 times higher than the number of items. At the same time, keywords plus, which are the number of keywords that frequently appear in an article's title were four times higher than the number of articles. The analysis period covers 22 years of scientific production. However, the most significant increase in published articles occurred in the past four years. On average two authors (2.56) have authored each article. The collaboration index, which is computed as the total number of authors of multi-authored articles divided by the total number of multi-authored articles, is 3.01 (Secinaro et. al., 2020).

Three field plots

A three-field plot or a Sankey plot helps show the flow from one set of data attributes to another and the interconnectedness between them.



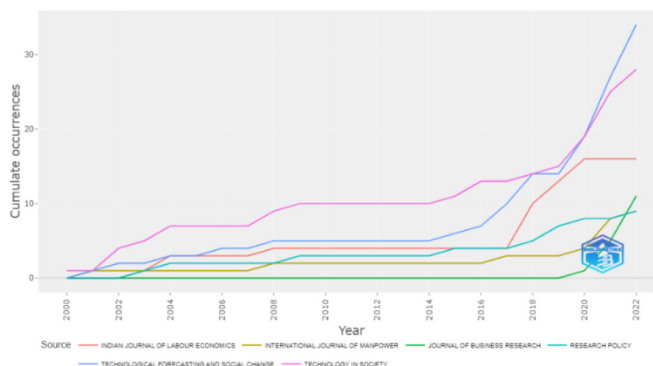
Source: Authors' elaboration using Biblioshiny

Figure 1
Three-field plot

They are a helpful way to visualize a many-to-many mapping between different attributes. As shown in Figure 1, the left column of the plot is the authors, the middle column are the keywords, and sources are on the right column. While the authors map to only some of the keywords, the extent of overlap between the top ten keywords and the journals they feature in is very high. The near equal width of the keywords in the graphic is indicative that the extent of coverage is nearly equal across these top ten journals.

Sources

Figure 2 shows the source dynamics of the top six journals. The LOESS (locally estimated scatterplot smoothing) method is used to plot this chart which shows the number of publications on the y-axis and time on x-axis. An upward trend is observed in scientific productivity in the research domain between the period 2000—2022. We infer that the rate of increase in the years between 2016-18 is accelerated, as futuristic technologies such as artificial intelligence (AI), Big Data, Cloud Computing, Internet of Things became more prevalent and began to impact economies, workplaces, organizational processes, and employability decisions. The rate of increase has been slower in the early pandemic years (2020-21). The authors believe that this research field is yet to enter a maturity phase with the number of publications showing a steady rise currently.



Source: Authors' elaboration using Biblioshiny

Figure 2

Source growth

Conclusions

This paper aims to map the evolution of research on 'future of work' and how technology is impacting the labor market. Research published between the period 2000—2022 was analyzed given that in the 21st century the impact of computers and information technology has been much more pronounced than in previous decades.

This paper makes a major contribution by consolidating fragmented literature in the area. In doing that, this paper also attempts to define the term 'future of work,' which is gaining a lot of prominence in the business world. This paper and its findings contribute to the literature by offering a scientometric and systematic way to review 'future of work'.

The Bibliometrix R-package, which is an open-source tool that researchers can use to conduct detailed mapping analysis of scientific literature was selected. The dataset was further refined using the PRISMA method. An analysis of the source growth indicates a steady state until 2016, post which coincides with the post-recovery phase of major economies following the great recession of 2008-09.

Major scholarly work in the areas has been conducted in UK and USA, followed by other mature economies such as Germany, France, Switzerland.

This information can help them to formulate policy frameworks for national level skill interventions to prevent mass unemployment or skill obsolescence.

Implications for Future Managers

The changing nature of work has implications for future managers. The technological revolution, and more recently the Covid-19 pandemic have altered the shape of organizations and changed the nature of individuals' work and their tasks. (Alfes et. al., 2022). The people managers need to rally the troops and ensure they are focusing on areas such adaptability, skill development, flexibility, collaboration, performance management, and work-life balance (Johnson, 2004; Ra et. al., 2019). Managers need to manage diverse workforces, incorporate technology, and respond to changing customer needs (Mayer et. al., 2021). They should invest in employee training and support career development (Ra et. al., 2019). Flexible work arrangements, teamwork, and effective communication are also important. Managers should develop new methods for performance management and prioritize work-life balance to prevent burnout and increase employee satisfaction.

AI and robotics are influencing the nature of work, replacing many jobs and enabling managers to be less operational and more strategic in orientation (Giraud et. al., 2022). AI and applications leveraging AI are also witnessing increasing adoption in overall HR management (Budhwar et. al., 2022; Jana et. al., 2022).

Future research directions

The current study uses the SCOPUS database. Future research can focus on extracting data from other databases and running bibliometric analysis on that dataset. Secondly, the current study has also focused on scientific mapping. Thirdly, a deeper content analysis of articles in this research field can be conducted to understand relevant theoretical models.

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