

A Bibliometric Analysis of Digital Recruitment Research from 2004 to 2024

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Abstract—Introduction/Main Objectives: This article provides an overview of bibliometric analysis of digital recruitment over the past 20 years. Recruitment is an essential part of human resource management because it determines the quality of the human resources that will join an organization. Technological developments also cannot be separated from the Human Resource Management aspect, including recruitment, so it influences the recruitment process by adopting information technology capabilities. So far, no one has carried out a bibliometric analysis on the topic of digital recruitment, so this article can be a guide for future researchers if they want to conduct research related to digital recruitment. **Research Methods:** The database used in this article is a database originating from Scopus, taking samples from 2004 to 2024 with a total of 149 documents. The application used to analyze and visualize data is VOSviewe with bibliographic coupling analysis, keyword co-occurrence, and temporal analysis. **Finding/Results:** Based on the analysis, the focus areas of this bibliometric analysis include 1) the application of human resource management, 2) the application of tools in Digital Recruitment, 3) processes involved in Digital Recruitment, and 4) Digital Recruitment in the medical health sector. Current themes emerging in this research include artificial intelligence, algorithms, recommender systems, and collaborative filtering, indicating new and relatively unexplored areas that could benefit from further investigation. Lastly, artificial intelligence and big data are increasingly shaping the future of human resource management, providing promising opportunities for future studies in Digital Recruiting.

Keywords: Artificial Intelligence Recruitment¹; Bibliometric Analysis²; Digital Recruitment³.

Abstrak—Pendahuluan/Tujuan Utama: Artikel ini memberikan gambaran mengenai bibliometric analisis tentang digital recruitment selama 20 tahun kebelakang. Recruitment merupakan salah satu bagian dari Human Resource Management yang penting karena menentukan kualitas Sumber Daya Manusia yang akan bergabung dalam suatu organisasi. Perkembangan teknologi juga tidak bisa lepas dari aspek Human Resource Management, termasuk recruitment, sehingga mempengaruhi proses recruitment dengan mengadopsi kemampuan teknologi informasi. Sejauh ini, belum ada yang melakukan analisis bibliometric mengenai topik digital recruitment, sehingga artikel ini bisa menjadi panduan bagi peneliti berikutnya jika ingin melakukan penelitian terkait digital recruitment. **Metode Penelitian:** Database yang digunakan dalam artikel ini adalah satabase yang berasal dari Scopus dengan mengambil sampel tahun dari 2004 hingga 2024 dengan jumlah 149 dokumen. Aplikasi yang digunakan untuk melakukan analisis dan memvisualisasikan data adalah VOSviewe dengan analisis bibliographic coupling; keyword co-occurrence; temporal analysis. **Temuan/Hasil:** Berdasarkan analisis area fokus analisis bibliometrik ini meliputi 1) penerapan manajemen sumber daya manusia, 2) penerapan alat dalam Rekrutmen Digital, 3) proses yang terlibat dalam Rekrutmen Digital, dan 4) Rekrutmen Digital dalam sektor kesehatan medis. Tema-tema terkini yang muncul dalam penelitian ini mencakup kecerdasan buatan, algoritma, sistem pemberi rekomendasi, dan pemfilteran kolaboratif, yang menunjukkan area baru dan relatif belum dijelajahi yang dapat memperoleh manfaat dari penyelidikan lebih lanjut. Terakhir, kecerdasan buatan dan data besar semakin membentuk masa depan manajemen sumber daya manusia, sehingga memberikan peluang yang menjanjikan untuk studi masa depan dalam Perekrutan Digital.

Kata kunci: Analisis Bibliometrik¹; Rekrutmen Digital²; Rekrutmen Kecerdasan Buatan³.



1. INTRODUCTION

Digitalization has emerged as a transformative force in recent decades, reshaping business operations and societal dynamics globally. This shift can fundamentally alter how organizations function and create value (Loebbecke & Picot, 2015). Consequently, many traditional organizations have recognized the imperative to undergo digital transformation, defined as the comprehensive reengineering of business activities, processes, competencies, and models to harness the benefits and opportunities provided by digital technologies (Demirkan et al., 2016). Effective recruitment strategies are crucial to support digital transformation by attracting and securing digital talent. Recruiting participants for clinical trials has consistently been one of the most arduous components of the research process (Tice et al, 2013). Traditionally, recruitment necessitated direct, in-person interactions with potential participants, predominantly conducted within clinical environments. This method posed significant challenges, including limited reach and high costs associated with the logistical aspects of managing in-person recruitment efforts. However, the landscape of participant recruitment is undergoing a significant transformation with the advent of digital technologies. Technological advancements have paved the way for a shift towards digital recruitment methods in recent years. These innovations include utilizing large databases, physiological sensors, and advanced communication tools, collectively facilitating the remote execution of clinical trial processes (Steinhubl, 2017). However, pre-digital companies face significant challenges in recruiting digital talent for two primary reasons. First, the scarcity of digital talent and high demand have resulted in an intense 'war for digital talent' (Edelman, 2012) among pre-digital and born-digital firms. Second, pre-digital organizations often lack familiarity with the new target group of digital talent, while these professionals may also be unaware of the opportunities within traditional firms. This mutual unfamiliarity further complicates the recruitment process for pre-digital companies, making it particularly challenging to attract the digital expertise needed for successful transformation. From the initial stages of recruitment to electronic consent, enrollment, and ongoing monitoring, these digital methodologies enable a fully remote approach. This paradigm shift has the potential to

significantly broaden the demographic reach of clinical trials, allowing for the inclusion of individuals who may have been previously excluded due to geographical, logistical, or financial barriers.

The transition to digital recruitment is poised to substantially reduce the overall costs associated with traditional recruitment methods, making clinical trials more accessible and efficient (Steinhubl, 2017). Moreover, the emergence of behavioral economics, particularly the concept of "nudges," combined with the growing ease of implementing randomized clinical trials through digital platforms, presents new avenues for understanding the factors that influence participation in clinical trials (VanEpps, 2016). These tools offer unprecedented opportunities to identify and address the motivators and barriers faced by potential participants, thereby optimizing recruitment strategies. Integrating digital recruitment strategies enhances the inclusivity and cost-effectiveness of clinical trials. It aligns with the broader trend of digitization in healthcare, promising a more agile and responsive research environment. Adopting digital recruitment represents a transformative shift in clinical trials and organizational operations, addressing longstanding challenges and opening new avenues for comprehensive and efficient practices. In clinical research, it enhances participant engagement and trial success by overcoming the limitations of traditional recruitment methods. Simultaneously, in the business sector, understanding the intricacies of digital recruitment is crucial for pre-digital organizations striving to adapt and thrive amidst the digital revolution. This dual exploration underscores the significance of digital recruitment in fostering successful outcomes across diverse domains.

Given the increasing importance and recognition of Digital Recruitment in Human Resource Management, this study aims to map the literature using a bibliometric analysis to reflect on the development of digital recruitment from 2004 to 2024. Bibliometric analysis involves applying statistical techniques to quantitatively review scientific output (Ellegaard & Wallin, 2015). By examining various elements that contribute to defining a field of study, such as publications, journals, countries, languages, and institutions, bibliometric analysis adds quantitative rigor to the typically subjective evaluation of literature

(Ellegaard & Wallin, 2015; Zupic & Čater, 2015). These bibliometric methods can provide a systematic, transparent, and reproducible review process, thereby enhancing the quality of reviews. They are valuable in literature reviews for guiding researchers to the most impactful works and mapping the research landscape, which helps mitigate subjective bias. Additionally, they enable researchers to base their findings on aggregated bibliographic data from other scientists through citations, collaborations, or authorship (Zupic & Čater, 2015). Analyzing this aggregated data allows researchers to delve into the structure of the field, social networks, and critical topics (Zupic & Čater, 2015).

In this research, we will utilize the VOS mapping technique from the VOSviewer software package to support the bibliometric analysis. Therefore, the primary goals of this study include (1) identifying different literature streams; (2) mapping the topics under investigation; (3) analyzing the temporal progression of the concept; and (4) determining the current developmental phase of the construct, highlighting its utility for the professional community beyond just academic bibliometric purposes.

2. LITERATURE REVIEW

Digital recruitment is a transformative approach to acquiring talent by leveraging digital technologies and platforms. This method fundamentally alters traditional recruitment processes by emphasizing the use of online tools, social media, and digital communication channels to attract, engage, and select candidates. Consequently, from the standpoint of digital human resources management, digital identity is becoming increasingly crucial. This is particularly important in the competitive landscape for talent, where there is a notable shortage of skilled workers, making the successful filling of positions, critically important (Monteiro et al, 2020)

Digital recruitment is an innovative method used to attract new employees to work in a company, focusing on finding promising workers quickly and efficiently (Vodianka, 2022). Shapovalova (2021) describe Digital recruitment refers to the recruitment industry's processes and tendencies in the digital environment, focusing on artificial intelligence technologies and remote work performed by HR agencies. Bublyk, M., & Kopach, T. (2023) define Digital recruitment is A key role of human resources management is to attract, assess,

and choose potential employees, with the objective of meeting the company's business goals. So, Digital recruitment is a strategic and innovative method within human resource management that utilizes digital tools and environments to attract, evaluate, and select potential employees. This approach emphasizes efficiency, leveraging technologies such as artificial intelligence to streamline the recruitment process and support business objectives. It also accommodates trends like remote work, aligning with modern industry practices to effectively meet organizational talent needs

Digital recruitment strategies are influenced by various factors, including user perceptions, expectations, attitudes, and intentions (Kramar, 2014). The quality of digital recruitment services and user satisfaction play critical roles in determining the effectiveness and sustainability of these strategies (Shet, 2020). Additionally, feedback mechanisms integrated into digital recruitment processes are essential for skill development and reducing employee turnover (Tsetsura, & Kruckeberg, 2017). This highlights the importance of a structured approach to recruitment that incorporates continuous feedback and development opportunities.

Two primary approaches have been identified in integrating sustainability into digital recruitment strategies: the economically oriented perspective, which views human factors as company resources, and a more integrative approach that balances meeting human needs with stakeholder interests (Shet, 2020). These approaches underscore the need to harmonize economic goals with sustainable development, thereby enhancing the social capital and organizational sustainability of tourism companies (Oncioiu, 2022)

3. METHOD

A sample of publications from the Scopus produced between 2004 and 2024 was used to meet the stated objectives. The WOS was selected because Scopus has 96.42% of its indexed journals also covered by Dimensions, making it essential for bibliometric analysis due to its comprehensive journal coverage (Singh et al., 2020). Scopus provides high-quality data for large-scale analyses in research assessments, research landscape studies, science policy evaluations, and university rankings (Baas et al., 2020).

The first step consisted of a descriptive survey of all publications of the two decades (2004–2024)

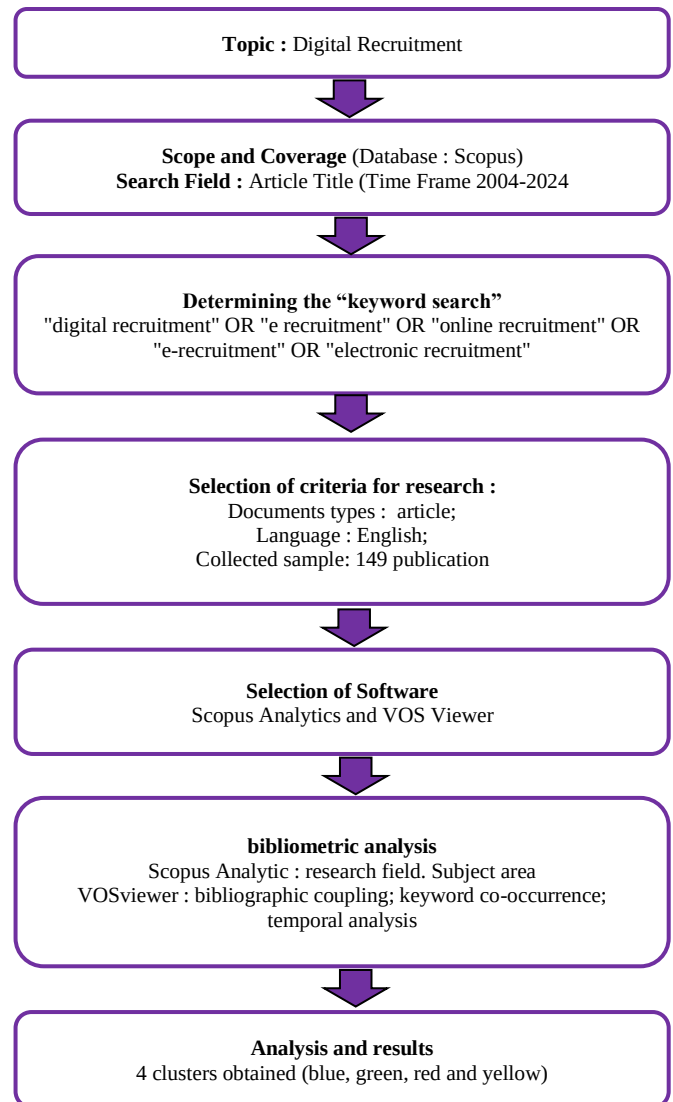
of the Scopus through a keyword search with the terms "digital recruitment" OR "e recruitment" OR "online recruitment" OR "e-recruitment" OR "electronic recruitment". The search was restricted to Scopus database with the some filter applied. The search engine criterion was "ARTICLE TOPIC", language was limited to English, and the result type was limited to Article only. there are no restrictions on research subject areas, because digital recruitment topics can be included in various subject areas

In the subsequent phase, VOSviewer was employed to analyze the sample. VOSviewer is a specialized software for bibliometric analysis that integrates techniques such as bibliometric coupling, historiographic citation, keyword co-occurrence, and thematic conceptual analysis to pinpoint key research clusters within franchising (Bretas & Alon, 2021). The software facilitates the visualization of bibliometric networks, a sophisticated tool for mapping scientific data. Visualization tools like VOSviewer enhance the analysis by managing substantial data volumes (Van Eck & Waltman, 2014). These visualizations include various analytical perspectives, such as keyword co-occurrence, co-citation, and co-authorship networks (Van Eck & Waltman, 2014).

In alignment with the methodology of Bellucci et al. (2020), this study's bibliometric maps utilized keyword co-occurrence networks to show the proximity of keywords within the sample, alongside bibliographic coupling to illustrate the relationships between publications based on shared references. Analyzing keyword co-occurrence reveals the frequency of term usage within the sample, creating a map that displays the interconnections among the conceptual frameworks in the sample (Zupic & Čater, 2015). The size of the circles and the connections correspond to the frequency of terms and the strength of their relationships, respectively, with more central terms indicating stronger connections across clusters. Bibliographic coupling assesses the similarity between scientific documents and can extend to deeper analysis for creating local science maps (Candel & Naccache, 2020). The closer the items are, the more references they share, indicating more significant content overlap (Li Hale, 2015). The circle sizes are proportional to the number of citations in Scopus, aiming to uncover the intellectual structure of digital recruitment. The

step-by-step method of the current paper is described in Figure 1.

Figure 1. Workflow of this Bibliometric Review.



4. RESULT AND DISCUSSION

The findings are organized into two parts: initially, a description of the keyword search sample is provided, and subsequently, the bibliometric maps generated by VOSviewer are showcased.

Keyword Search

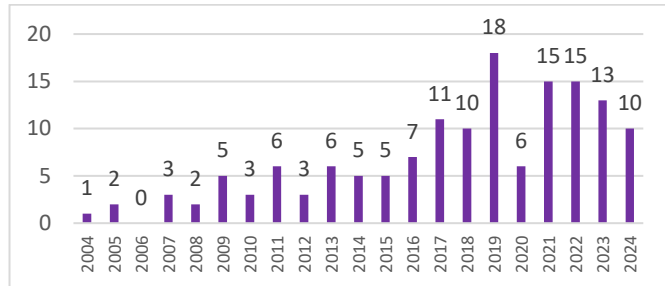
The keyword search use "digital recruitment" OR "ai recruitment" OR "e recruitment" OR "online recruitment" OR "e-recruitment" OR "electronic recruitment" conducted on 13 July 2024 resulted in a total of 149 publications.

Evolution of the Number of Publications

Figure2 depicts the evolution of the number of publications per year between 2004 and 2024. The

highest volume of publications occurred in the year 2019 (N = 18), which represents 12,08% of the sample.

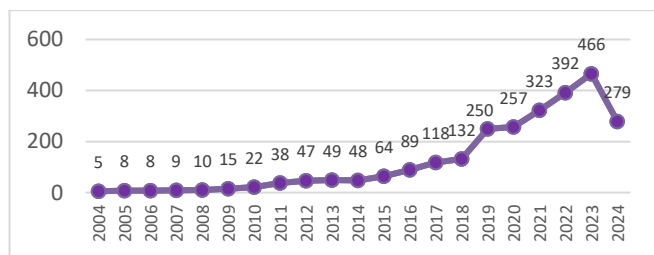
Figure 2. Evolution of the Number of Publications per Year



Evolution of the Number of Citations

The 149 publications collectively account for 2,629 citations (refer to Figure 3). Noteworthy is the trendline, which illustrates an initially minimal scientific discourse at the start of the decade, followed by a significant increase beginning around 2019.

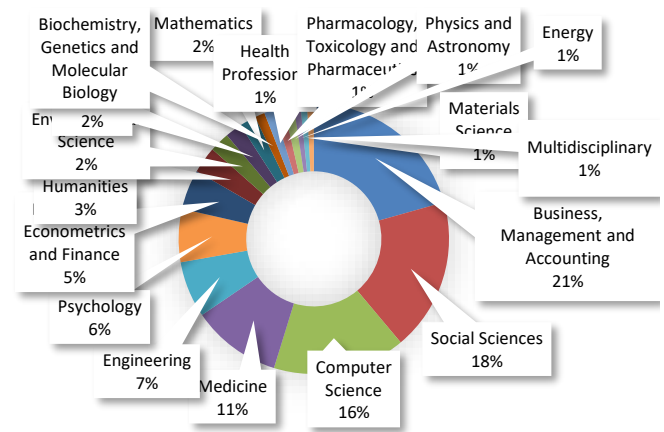
Figure 3. Evolution of the Number of Citations per Year.



Subject Area

Figure 4 depicts the evolution of the number of subject area. The highest volume of subject area is Business, Management and Accounting which represents 21% of the sample.

Figure 4. Subject Area of publication



Authors Affiliation

The scientific production related to Digital Recruitment is mainly represented by China, Malaysia and England (Table1). Please note that the table only includes the ten most active authors' affiliations.

Table 1. Authors affiliation

Countries/Regions	Record Count
United States	36
India	12
United Kingdom	12
China	11
Australia	10
Malaysia	7
Canada	6
Spain	5
Denmark	4
Greece	4

Most Cited Publications

According to Scopus criteria "Highly cited papers", these are the most-cited publications (Table2).

Table 2. Most-Cited Publications

Title	Author	Year	Journal	Cit
Marketing AI recruitment: The next phase in job application and selection	Van Esch, P., et al	2019	Computers in Human Behavior	167
Bias in Online recruitment and retention of racial and ethnic minority men who have sex with men	Sullivan, P.S., et al	2011	Journal of Medical Internet Research	126
An integrated e-recruitment system for automated personality mining and applicant ranking	Faliagka, E., et al	2012	Internet Research	97

Discrimination of Arabic-named applicants in the Netherlands: An internet-based field experiment examining different phases in online recruitment procedures	Blommaert, L., et al	2014	Social Forces	88
The Use of Social Network Sites as an E-Recruitment Tool	Melanthio, Y., et al	2015	Journal of Transnational Management	84
Ethics and privacy implications of using the internet and social media to recruit participants for health research: A privacy-by-design framework for online recruitment	Bender, J.L., et al.	2017	Journal of Medical Internet Research	83
A study of e-recruitment technology adoption in Malaysia	Tong, D.Y.K	2009	Industrial Management and Data Systems	79
An analysis of the use and success of online recruitment methods in the UK	Parry, E. & Tyson, S.	2008	Human Resource Management Journal	79
A Comparison of Three Online Recruitment Strategies for Engaging Parents	Dworkin, J., et al	2016	Family Relations	78
On-line consistent ranking on e-recruitment: Seeking the truth behind a well-formed CV	Faliagka, E., et al	2014	Artificial Intelligence Review	60

Bibliometric Maps

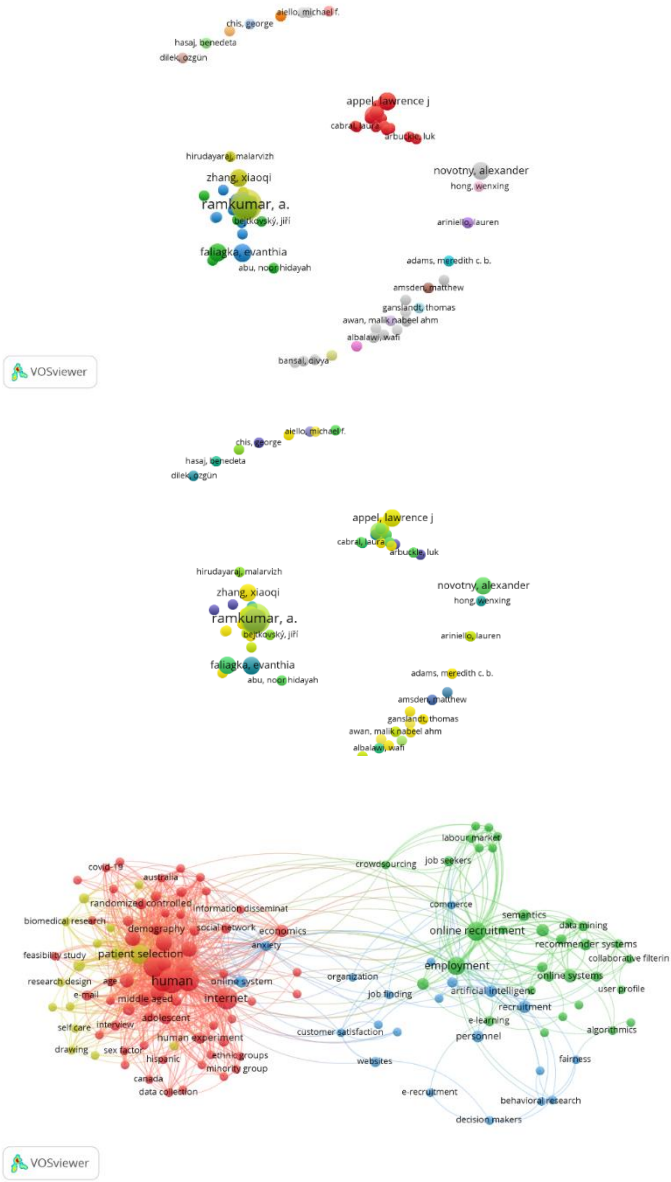
Subsequently, we present the VOSviewer bibliometric maps derived from both the bibliographic reference coupling analysis (refer to Figure 5) and the keyword co-occurrence network analysis (refer to Figure 7). This analysis encompasses the 149 publications released between 2004 and 2024.

Bibliometric Coupling

Figure 5. Bibliographic coupling

Based on Figure 5, it can be seen that the connection between authors is very low, only a few authors with two focuses appear to be connected to each other as in the picture. while those on the outside show no connection.

Figure 6. Bibliographic coupling with temporal analysis

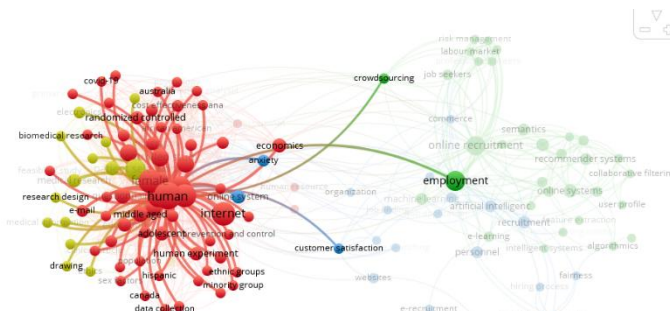


At this stage, the researcher establishes a threshold whereby keywords shared by at least two publications are displayed. Specifically, keywords appearing together in three or more publications are highlighted using VOSviewer. It is important to note that this analysis includes the "keywords plus" option provided by VOSviewer. Out of 739 keywords, only 145 remained after

applying the threshold, as depicted in Figure 7. These keywords frequently appear in the titles of the bibliographical references in the sample. This selection criterion enriches the resulting bibliometric map, enabling a more comprehensive sample analysis.

The research focus can be discerned from the clusters represented in Figure 7, where different colours indicate distinct research clusters related to digital research. There are four clusters: the largest is red, followed by green, blue, and yellow. This indicates that the research is divided into four main areas: 1) The first cluster, in red, comprises 63 items. The giant circles in this cluster represent keywords such as "humans," suggesting these are central to the research focus in this cluster. 2) The second cluster, in green, includes 32 items, with "employment" and "e-recruitment" being the most prominent circles, indicating these keywords are central to the research focus, alongside the capacity for creative thinking. 3) The third cluster, in blue, consists of 21 items, focusing on "artificial intelligence." 4) The fourth cluster, in yellow, contains 16 items, focusing on keywords like "patient selection," which are central to the most recent research.

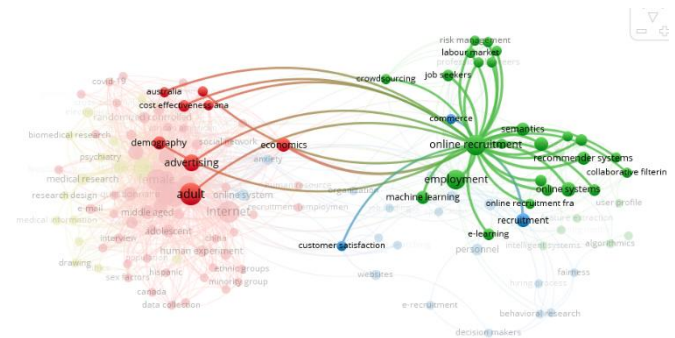
Figure 8. First Research Focus (Red Cluster)



The initial research focus comprises 63 items, emphasizing keywords such as “human,” “internet,” “male,” “female,” “demography,” “ethnic group,” “human experiment,” “cost-benefit analysis,” “economic,” and “email.” This cluster underscores the implementation of Human Resource Management (HRM). The implementation of HRM is a dynamic process that involves multiple stakeholders, starting with the adoption of a new practice and culminating in its routinization (Trullén et al., 2020). Key factors contributing to the successful implementation of HRM in Industry 4.0 include an efficient HR framework tailored for Industry 4.0 and a deeper

understanding of how Industry 4.0 impacts HR management (Verma & Venkatesan, 2021). Notably, the cluster emphasizes the focus of HRM, which centers on the recruitment, retention, and motivation of personnel to optimize human potential and achieve organizational goals (Ochieng, 2023). Additionally, HRM is concerned with managing a company's human resources department, overseeing daily operations, and assessing employee performance (Bandara et al., 2022).

Figure 9. Second Research Focus (Green Cluster)

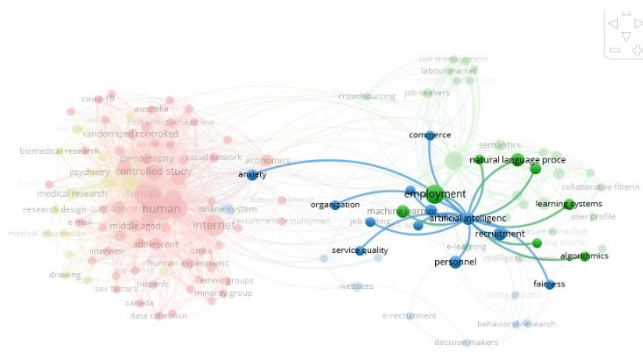


The second research focus consist of 32 item. The keywords “online recruitment”, “online system”, “machine learning”, “e-learning”, “crowd sourcing”, “labour market”, “job seeker”, “recommender system”, “collaborative filtering”, “algorithmic”, “big data” and “semantics” are highlighted. the cluster highlights the implementation in Digital recruitment. Digital technologies in recruitment, such as social networks, chatbots, and artificial intelligence, contribute to improving the stages of identifying, selecting, and retaining talented people (Allal-Chérif , 2021). Digital technologies in recruitment optimize the system, minimize subjective impact, and reduce complexity, increasing a company's competitiveness in the economic market (Grishin, 2022).

Significantly, the cluster encompasses digital recruitment tools. According to Esch and Black (2019), social media usage, intrinsic rewards, fair treatment, and perceived trendiness positively influence candidate engagement in AI-enabled recruitment processes. Frampton et al. (2020) highlight that the most frequently researched digital tools in recruitment include social media, internet sites, email, and TV/radio for recruitment purposes, as well as email and text messaging for retention efforts. Grishin (2022) notes that digital technologies in recruitment

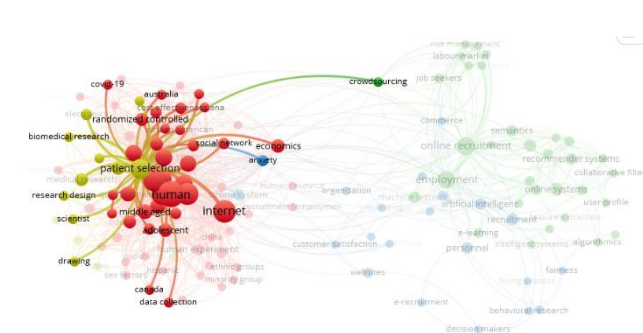
encompass ATS systems, HR bots, and artificial intelligence. Venkatesh (2023) points out that companies utilize digital tools such as digital data, chatbot technology, AI in HR, AI recruitment, and cloud HR for digital recruitment.

Figure 10. Third Research Focus (Blue Cluster)



The third research focus consist of 21 item. The keywords “artificial intelegence”, “recruitment”, “personnel”, “service quality”, “fairness”, “job finding”, “hiring process”, “decision maker”, “websites”, “recruitment process”, “job application” and “online searching” are highlighted. the cluster highlights the Process of digital recruitment. Digital recruitment processes involve digitizing human resources management, focusing on employee qualifications, tasks, and tools, while addressing the needs of a more competitive business environment (Baykal et al, 2020). Digital recruitment processes involve using software programs and algorithms to eliminate human factors and create a transparent and decentralized recruitment process (Moşneanu, 2020).

Figure 11. Fourth Research Focus (Yellow Cluster)



The fourth research focus consist of 15 item. The keywords “patient selection”, “biomedical research”, “scientist”, “medical information”, “selfcare”, “psychiatry”, “aged”, “mental health”, and “epidemiology” are highlighted. the cluster highlights the digital recruitment in medical health sector. Digital tools like database-screening tools are widely used for recruitment in medical health trials, with success criteria including saving General Practitioner time and reaching more patients Blatch-Jones, et al (2019). Digital health technologies can improve pharmacogenetic trial design and operation by addressing challenges in patient recruitment, patient diversity, and complex workflows (Naik, 2020).

Figure 12. Keyword co-occurrence network with temporal analysis.

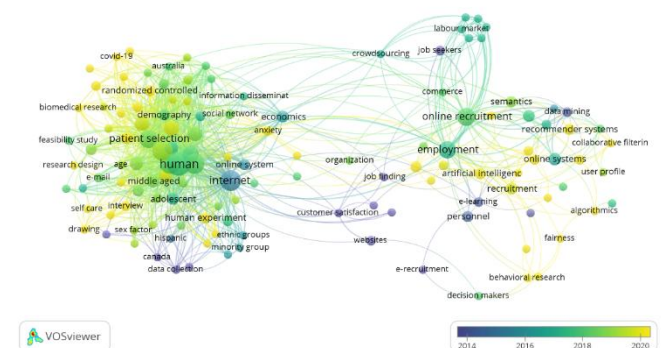


Figure 12 displays three distinct colours, with yellow representing the latest research. This section introduces updates and emerging themes in Digital Recruitment, including artificial intelligence, algorithmics, recommender systems, and collaborative filtering. These areas signify relatively underexplored topics, suggesting their potential usefulness for future research. Additionally, numerous indirect connections are observed upon examining the links between the first and second research focuses, indicating a gap that could benefit further investigation to identify novel research directions.

5. CONCLUSION

The bibliometric analysis of literature from 2004 to 2024 underscores the growing significance of Digital Recruitment, particularly from the latter half of the two decades. Digital recruitment aims to enhance the efficiency and effectiveness of hiring processes in companies by integrating information

technology and human resource principles. The findings indicate that 2019 saw the highest number of publications with 18 articles, while 2023 garnered the most citations on trending topics related to Digital Recruitment, totaling 466. The focus areas of this bibliometric analysis include 1) the implementation of human resource management, 2) the application of tools in Digital Recruitment, 3) the processes involved in Digital Recruitment, and 4) Digital Recruitment within the medical health sector. Emerging themes in the research include artificial intelligence, algorithms, recommender systems, and collaborative filtering, indicating new and relatively unexplored areas that could benefit from further investigation. Additionally, there are significant research gaps, particularly in linking the first and second focus areas, which present opportunities for novel research. Lastly, artificial intelligence and big data are increasingly shaping the future of work, highlighting a promising avenue for future studies in Digital Recruitment.

The limitations of this research are as follows:

1) The data analyzed is sourced exclusively from the Scopus database, whereas other databases like WoS could provide additional insights; 2) This study focuses solely on digital recruitment and does not encompass other aspects of Human Resource Management; 3) The data was collected up to June 15, 2024, and thus may not reflect subsequent developments in the field.

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