

HUMAN RESOURCES AS A STRATEGIC ENABLER OF CIRCULAR ECONOMY ADOPTION: A BIBLIOMETRIC AND THEMATIC ANALYSIS

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Abstract

This paper presents a comprehensive bibliometric and thematic analysis of 313 peer-reviewed articles indexed in Scopus, mapping the intersection between circular economy (CE) and human resources (HR). The study confirms the central role of HR in enabling the adoption and diffusion of CE practices across industries and regions. Our findings highlight that the success of CE initiatives depends not only on technological advancements and structural changes but critically on the preparedness, engagement, and well-being of the workforce. Key HR practices-including skill development, leadership cultivation, digital and virtual training, and inclusive talent management-are shown to be vital for equipping employees with the capabilities needed to implement circular strategies. The analysis reveals the growing importance of integrating digital technologies, such as Industry 4.0 tools, with human capital development, while also emphasizing the need for supportive working conditions, including safe, fair, and inclusive workplaces, to stimulate sustainable behaviors. The study identifies 15 thematic clusters and highlights emerging topics such as digital circular economy, circular entrepreneurship, and decent work. This paper contributes to understanding the strategic role of HRM in circular transitions and suggests directions for future research on contextual factors, digital readiness, and HR's role in advancing circular business models globally.

Keywords: circular economy, human resource management, skills, training, engagement

1. INTRODUCTION

In the post-pandemic period, the transition towards a circular economy (CE)

in a new normal situation has gained growing attention as a viable strategy to address global environmental challenges, resource scarcity, and the pursuit of

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economic sustainability (Plotnic & Praporšćic, 2023). Unlike the traditional linear model of production and consumption, the circular economy calls for a systemic shift that involves monitoring and managing key components such as inputs, outputs, resources, production, distribution and services, consumption, waste management, design, and education (Suárez-Eiroa et al., 2019). While much of the existing research has focused on technological innovation, supply chain redesign, and new business models to support this transition, the role of human resources (HR) and workforce management has so far received limited and fragmented attention. However, several studies have highlighted that the human side of organizations is essential in driving the organizational change needed to implement circular economy principles. Jabbour et al. (2019), for instance, stress that HR practices, employee engagement, leadership, and organizational culture are fundamental to fostering circularity within firms. Their review shows that, despite this importance, the human dimensions of the circular economy have been only marginally studied, and deeper analyses are still lacking. Furthermore, García-Quevedo et al. (2020) point out that the absence of adequately skilled human resources represents a major barrier to the adoption of circular practices, particularly among small and medium-sized enterprises in Europe. This shortage of circular economy-related competencies and environmental expertise limits the ability of firms to innovate and effectively implement circular strategies. In this context, Bassi and Guidolin (2021) underline the need for programs that promote the development of green jobs and skills to support this transition. Considering that the success of circular economy initiatives depends not

only on technological or structural factors but also on the skills, behaviors, and commitment of employees at all levels, it is crucial to explore how HR can contribute to this process. Green and circular HRM practices, as well as organizational learning, have the potential to promote circular mindsets, support the development of green competencies, and cultivate organizational cultures aligned with circularity principles (Subramanian & Suresh, 2022). According to these authors, businesses need to frame circular economy concepts in terms of human capital, creating training materials that enhance employees' knowledge and expertise in circular practices. Encouraging green behaviors from the hiring stage and fostering an organizational learning culture focused on circularity can motivate employees to engage in environmental activities and support the spread of circular practices.

The aim of this paper is to systematically review and map the existing literature at the intersection of circular economy and human resource management. To achieve this, we adopt a scoping review methodology, which offers a structured framework to map existing studies, identify key themes, and provide a comprehensive understanding of how human resources and circular economy principles interact in the evolving business landscape.

The paper is structured as follows: the next section describes the methodology used in this study. This is followed by the results section, which presents the main contributions identified and analyzed. The findings are discussed through a descriptive analysis of the literature's temporal and geographical distribution, as well as its thematic focus. Finally, the paper concludes with a discussion of the key implications,

limitations, and directions for future research.

2. METHODOLOGY

This study adopts a scoping review methodology, following the framework proposed by Arksey and O'Malley (2005), with the aim of mapping key concepts and research trends at the intersection between the circular economy and human resources. The scoping review approach is particularly suited for areas where the literature is fragmented or emerging, as it enables the rapid identification and synthesis of existing knowledge without the constraints of a formal systematic review.

The objectives of this scoping review are twofold. First, it aims to summarise and disseminate research findings in a way that is accessible and useful to policymakers, practitioners, and other stakeholders, thereby serving as a tool for knowledge transfer. Second, it seeks to identify knowledge gaps in the literature by highlighting areas that have been understudied or overlooked,

providing a basis for setting future research agendas (Tricco et al., 2016). While the review does not formally assess the quality of the included studies, it offers valuable insights into the extent, range, and nature of research in this field.

The review followed the five stages of the Arksey and O'Malley (2005) framework (Table 1).

1. Identifying the research question: the central question guiding this review is: What is the current state of knowledge regarding the role of human resources in supporting the adoption and promotion of circular economy principles and practices?

2. Identifying relevant studies: the literature search was conducted using the Scopus database. Scopus was selected as it is one of the largest and most comprehensive abstract and citation databases of peer-reviewed literature, covering a wide range of disciplines, including business, management, and environmental studies (Pranckutė, 2021). It is recognized for its rigorous indexing standards and provides extensive coverage of high-quality journals, making it particularly suitable for mapping the

Table 1. The main stages of the scoping review (Source: Authors' elaboration)

Stage	Description
1 Identifying the research question	What is the current state of knowledge regarding the role of human resources in supporting the adoption and promotion of circular economy principles and practices?
2 Identifying relevant studies	Scopus database search with iterative refinement of keywords The final version of query: "circular" AND "human resource*" OR "employee*" OR "staff" OR "worker" OR "workforce" OR "personnel" Total of 3,384 documents
3 Study selection	Document type = Article Language= English, Subject Area = Business, Management and Accounting Total of 313 documents
4 Charting the data	Extraction in .csv Analysis of results in Scopus Analysis through VOSViewer
5 Collating, summarising, and reporting the results	Synthesize data, provide descriptive and thematic analysis

research landscape in interdisciplinary fields such as circular economy and human resource management. The search strategy was designed as an iterative and reflexive process, in line with best practices for scoping reviews. Rather than setting rigid parameters at the outset, search terms and criteria were refined progressively to ensure comprehensive coverage of the literature (Arksey & O'Malley, 2005). The initial search was conducted using the keywords: "circular economy" AND "human resource"*. A preliminary review of titles, keywords, and abstracts suggested the need to broaden the search to capture additional relevant studies. The final search query was revised to: "circular" AND "human resource*" OR "employee*" OR "staff" OR "worker" OR "workforce" OR "personnel". This search yielded a total of 3,384 documents.

3. Study selection: Inclusion criteria were applied to focus the review: only documents classified as articles, written in English, and

falling under the Business, Management and Accounting subject area were retained. Applying these criteria resulted in a final set of 313 documents for detailed analysis.

4. Charting the data: The process of data extraction and organization is detailed in the following section ("Results"), where we present how key information from the selected studies was charted and categorized.

5. Collating, summarising, and reporting the results: The results section also presents the synthesis of the data, including descriptive statistics and thematic analysis, highlighting key patterns and gaps in the literature.

3. RESULTS

3.1. Bibliometric analysis

The dataset extracted from Scopus (Table 2) presents key characteristics of the academic production on circular economy

Table 2. The main information on the dataset (Source: Biblioshiny)

Description	Results
MAIN INFORMATION ABOUT DATA	
Timespan	1973:2025
Sources (Journals, Books, etc.)	164
Documents	313
Annual Growth Rate, %	7,5
Document Average Age	5,28
Average citations per doc	29,07
References	20592
DOCUMENT CONTENTS	
Keywords Plus (ID)	1105
Authors keywords (DE)	1100
AUTHORS	
Authors	906
Authors of single-authored docs	51
AUTHORS COLLABORATION	
Single authored docs	51
Co-authors per doc	3,09
International co-authorship, %	31,63
DOCUMENT TYPES	
Article	313

and human resources. It spans the period from 1973 to 2025 and includes 313 documents published across 164 sources, showing an annual growth rate of 7.5%. The documents have an average of 29.07 citations per document, indicating notable scholarly impact.

The dataset comprises a rich body of literature with 1100 author's keywords, reflecting the diversity of topics covered. A total of 906 authors contributed, with 51 single-authored documents. Collaboration is strong, with an average of 3.09 co-authors per document and 31.63% international co-authorships, highlighting global interest in the topic.

All documents are classified as articles, confirming the scientific and peer-reviewed

nature of the dataset.

Figure 1 illustrates the number of publications on the selected topic indexed in the Scopus database, distributed across publication years. It is evident that the number of publications remained low and stable between 1973 and around 2015, with only 1 to 6 publications per year. Starting from 2016, there is a noticeable increase in output, with a sharp rise in publications particularly after 2018. The most significant growth appears from 2020 onwards, peaking in 2024 with 56 publications. This trend indicates a growing interest in the topic within the academic community, with a sustained increase in research activity in recent years, especially in the last five years.

Figure 2 shows the geographical

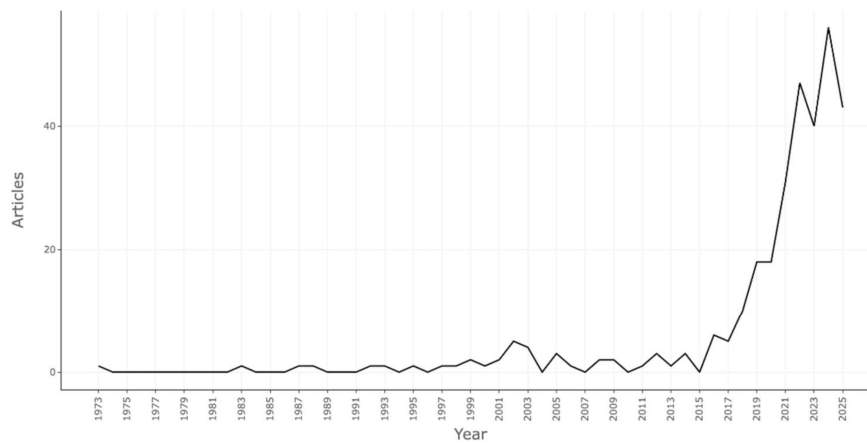


Figure 1. Distribution of documents by year (Source: Biblioshiny)

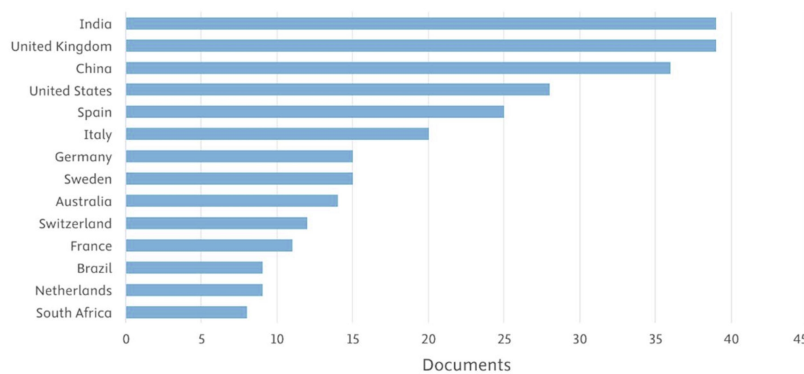


Figure 2. Distribution of documents by country (Source: Scopus)

distribution of publications by country, based on Scopus data. India and the United Kingdom are the top contributors, followed by China and the United States. Several European countries and Australia also display notable research activity on the topic. This data highlights the broad international engagement in the study of the topic.

Figure 3 shows the main journals where contributions on the analysed topic have been published, along with their publication trends over time. Knitting International appears as the earliest source, with publications dating back to the 1990s and

early 2000s. Starting from 2012, the Journal of Cleaner Production emerges and shows a significant rise in publications, peaking in the early 2020s. More recently, journals like Business Strategy and the Environment, Corporate Social Responsibility and Environmental Management, Administrative Sciences, Management Decision, and Worldwide Hospitality and Tourism Themes have contributed, mainly from 2020 onwards, reflecting growing academic interest in sustainability and management topics from different points of view.

Figure 4 shows the local impact of

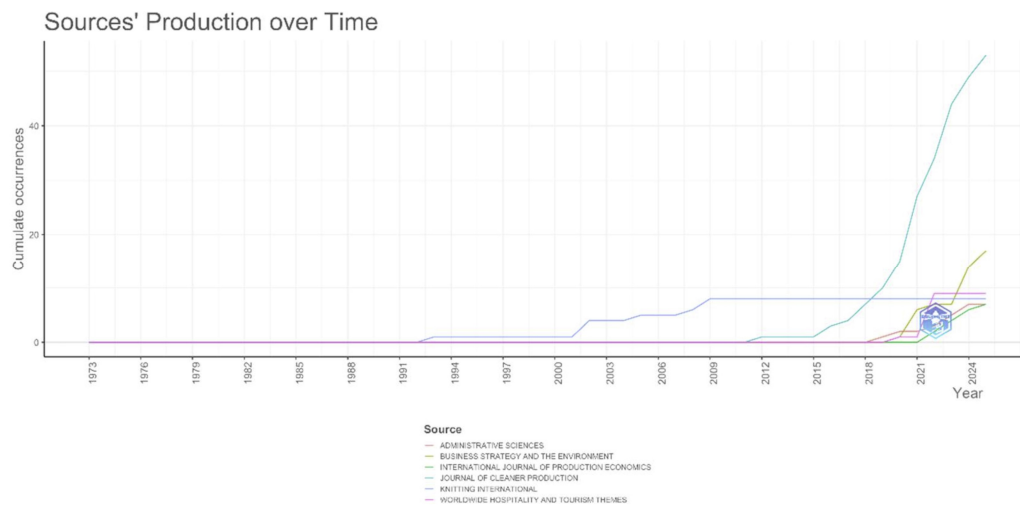


Figure 3. Sources production over time (Source: Biblioshiny)

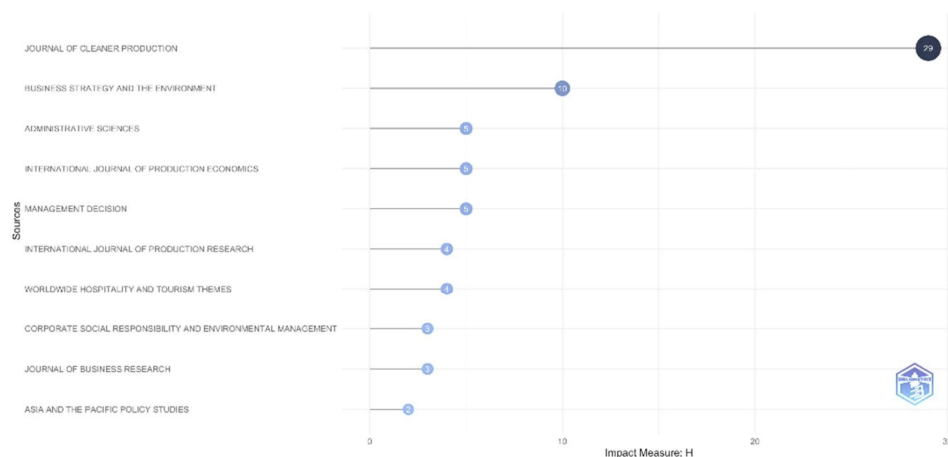


Figure 4. Sources' Local Impact (Source: Biblioshiny)

sources measured by the H-index within the dataset. The Journal of Cleaner Production stands out as the most influential source, with an H-index of 29, significantly higher than the others. Business Strategy and the Environment follows with an H-index of 10. Other key journals, including Administrative Sciences, International Journal of Production Economics, and Management Decision, each show a local H-index of 5. This distribution highlights that research on circular economy and human resources is concentrated in a few high-impact journals, particularly in sustainability and production fields.

Figure 5 shows the most relevant authors

in the field of circular economy and human resources based on the number of documents in the dataset. Mangla is the leading contributor with 5 documents, followed by Bag, Kumar, and Zhang each with 4 documents. Authors such as Chowdhury, Dey, Subramanian, and Vann Yarason have each contributed 3 documents, while Alghababsheh and Ali have 2 documents each.

Figure 6 represents the most relevant affiliations in terms of the number of articles contributed to the study of circular economy and human resources. Sapienza University of Rome leads with 13 articles, followed

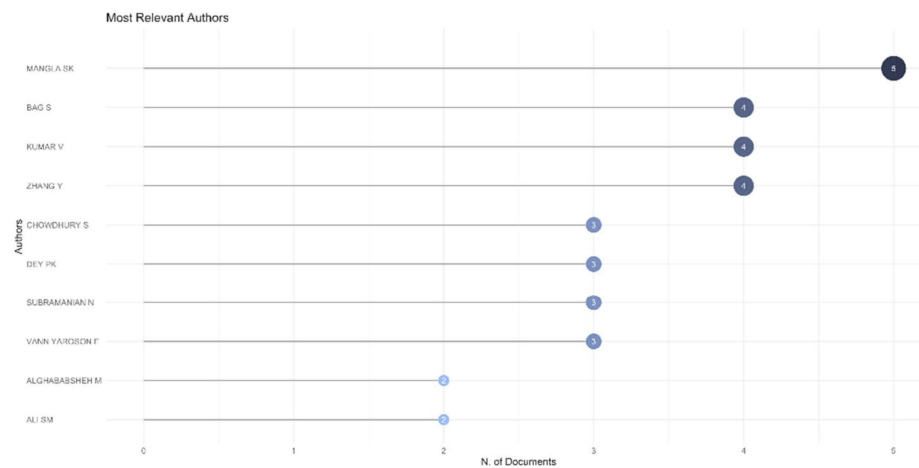


Figure 5. Most relevant authors (Source: Biblioshiny)

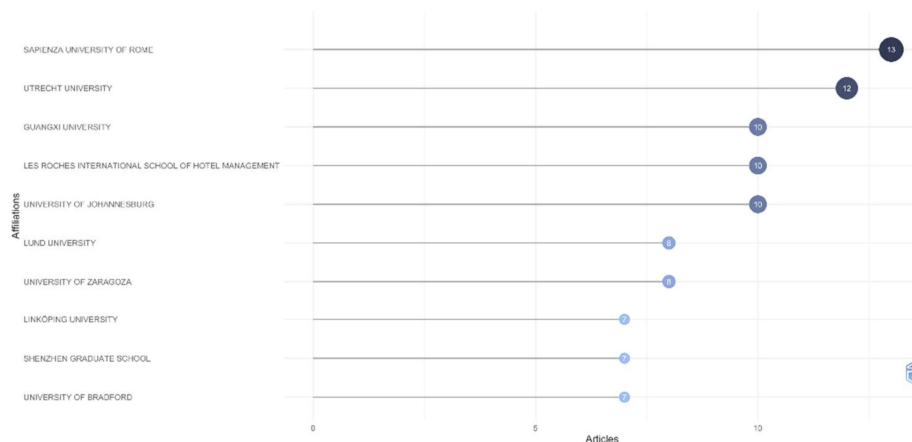


Figure 6. Most relevant affiliations (Source: Biblioshiny)

- Cluster 3 - Green innovation and competitiveness. This cluster combines cleaner production, green jobs, digitalization, and system thinking, addressing how SMEs enhance competitiveness through green innovation. HR's contribution lies in creating green jobs and shaping workforce policy to support sustainable growth.

- Cluster 4 - Circular entrepreneurship and production. With items such as remanufacturing, recycling, reuse, decision making, and job satisfaction, this cluster connects circular operations with workforce

Table 3. The keywords' clusters (Source: Authors' elaboration)

N.	Cluster Name	Number of items	Keywords
1	Circular Economy and environmental impacts	18	carbon emission, circular economy, climate change, effectiveness, efficiency, environment, financial performance, ghana, green human resources, green practices, management, organizational learning, psychology, reverse logistics, saudi arabia, small and medium enterprises, waste, waste management
2	Strategic implementation and leadership in Circular Economy	12	circular economy implementation, digital circular economy, esg, firm performance, innovation, leadership, pls-sem, social enterprise, strategic management, sustainable development goals, sustainable entrepreneurship
3	Green innovation and competitiveness	11	cleaner production, cluster analysis, competitiveness, digitalization, green innovation, green jobs, policy, resource recovery, small and medium enterprises, smes, system thinking
4	Circular entrepreneurship and production	11	circular economy, circular entrepreneurship, decision making, digital technologies, job satisfaction, lean production, maintenance, product development, recycling, remanufacturing, reuse
5	Human capital and Sustainable HRM	11	egypt, food waste, green human resource management, hospitality industry, human capital, industrial robots, institutional theory, isomorphic pressure, observation, sustainability, sustainable human resource management
6	Circular Economy enablers	11	additive manufacturing, circular economy practices, covid-19, dematel, e-waste management, enablers, green hr, industry 4.0, supply chain management, sustainable performance, systematic literature review
7	Industrial ecology and systems thinking	9	artificial intelligence, industrial ecology, industrial symbiosis, life cycle assessment, resource efficiency, resource-based theory, sustainable manufacturing, system dynamics, Thailand
8	Circular migration and labour mobility	8	agriculture, circular migration, entrepreneurship, human resources, labour mobility, stakeholders, strategy, temporary migration
9	Circular work, skills, and training	8	circular mobility, circular supply chain management, decent work, eco-innovation, employees, european union, sustainable development goals, training
10	Capabilities for Circular Business Models	8	apparel, barriers, capabilities, circular business model innovation, circular business model, dynamic capabilities, skills, stakeholder engagement
11	CSR and quality of life	6	corporate social responsibility, csr, hospitality, qol, quality of life, work-life balance
12	Inclusive HRM and Sustainability Goals	6	china, energy efficiency, environmental sustainability, human resource management, inclusion, sustainable development
13	Sharing Economy and Business Model Innovation	3	business models, business model innovation, sharing economy
14	Supply Chain Resilience	2	circular supply chain, resilience
15	Sustainability Reporting and Transparency	2	environmental reporting, sustainability reporting

outcomes. HR is involved in promoting worker engagement and satisfaction in circular production systems.

- Cluster 5 - Human capital and Sustainable HRM. Including green human resource management, human capital, hospitality industry, and food waste, this cluster focuses on HRM's influence in service and food industries, supporting sustainable human resource management and organizational change.

- Cluster 6 - Circular Economy enablers. This cluster features industry 4.0, green HRM, additive manufacturing, and supply chain management, examining technological enablers of circular economy. Green HRM in this case could be perceived like a enabler of tech-driven sustainability and circularity.

- Cluster 7 - Industrial ecology and systems thinking. Bringing together industrial symbiosis, life cycle assessment, and resource efficiency, this cluster reflects systems-level sustainability. HR supports cross-disciplinary collaboration and capacity building in system dynamics contexts.

- Cluster 8 - Circular migration and labour mobility. This cluster covers circular migration, human resources, labour mobility, and entrepreneurship, highlighting workforce dynamics in circular enterprises.

- Cluster 9 - Circular work, skills, and training. Including decent work, employees, training, and eco-innovation, this cluster underscores HR's essential role in skill development, workforce training, and fostering decent work in circular contexts.

- Cluster 10 - Capabilities for circular business models. This cluster focuses on circular business model innovation, dynamic capabilities, skills, and stakeholder engagement. HR practices are perceived as important for developing employee skills and capacities for circular business model

transformation.

- Cluster 11 - CSR and quality of life. With CSR, hospitality, quality of life, and work-life balance, this cluster addresses the social dimensions of sustainability, where HR practices enhance employee well-being and work-life integration.

- Cluster 12 - Inclusive HRM and Sustainability Goals. This cluster links human resource management, inclusion, sustainable development, and energy efficiency, reflecting HR's role in fostering inclusive, sustainable workplace cultures

- Cluster 13 - Sharing economy and business model innovation. Focusing on business model innovation and sharing economy, this cluster explores emerging economic models.

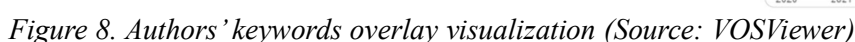
- Cluster 14 - Supply Chain resilience. Combining circular supply chain and resilience, this small cluster addresses supply chain stability.

- Cluster 15 - Sustainability reporting and transparency. Including environmental reporting and sustainability reporting, this cluster highlights the importance of organizational accountability. HR in this case are resources that can contribute to building a culture that values transparency and reporting.

Based on the overlay visualization (Figure 8), the most recent and emerging themes in 2024 at the intersection of human resources and circular economy include:

- Theoretical foundations: "Institutional theory" and "resource-based theory" are increasingly applied to explain how organizations adopt circular economy practices.

- Impact of digitalization: keywords like "industrial robots" and "digital circular economy" reflect growing interest in how digital technologies transform circular



4. DISCUSSION

This study provides a comprehensive mapping of the intersection between circular economy (CE) and human resources (HR), confirming that human resources play a central and strategic role in enabling the adoption and success of circular economy practices. The bibliometric and thematic analyses of 313 articles indexed in Scopus demonstrate that skilled, engaged, and well-supported employees are essential for implementing and sustaining circular strategies across sectors and regions. At the core of the CE adoption is the need for appropriate HR practices that foster the development of necessary skills and competencies. Effective training, leadership development, and talent management strategies help prepare the workforce for the demands of circular business models. As Anshari and Ordóñez de Pablos (2025) point out, it is crucial to identify and cultivate both “must-have” and “good-to-have” skills linked to Industry 4.0 technologies, calling on educational institutions to redesign

on educational institutions to redesign

- Inclusion and decent work: these keywords signal increasing attention to social sustainability, where sustainable HR practices promote inclusive workplaces and ensure decent work conditions as part of circular economy transitions.

curricula that build both soft skills and technological capabilities. Delvaux and Delvenne (2024) further stress that quality of work in the circular economy depends on new knowledge and training, especially in contexts where skilled workers are scarce. In addition, Bilderback, et al. (2025) highlight the transformative role of virtual training within sustainable development frameworks, underlining its potential to reshape workforce strategies and contribute to economic and social progress. Digital training tools are becoming essential in equipping employees for the evolving demands of circular enterprises. However, preparing human resources through training alone is not sufficient. It is equally important to create the right conditions that enable and motivate green behaviors. Pambudi et al. (2025) emphasize the need for safe working conditions, fair wages, and inclusive workplaces to ensure that circular economy practices genuinely support both environmental goals and worker well-being. These working conditions are critical for engaging employees in meaningful and sustained participation in circular initiatives. Moreover, as Vijayakumar and Davidova (2025) argue, digital technologies, technology infrastructure, and a skilled workforce together act as key enablers of CE adoption. These elements, supported by HRM practices, form the foundation for successful circular transformation. The thematic analysis of this study identified fifteen clusters reflecting these priorities, with key topics including green human resource management, sustainable HRM, circular entrepreneurship, labour mobility, and digital circular economy. These clusters align with prior research showing that HR practices - when designed in consideration of sectoral, regional, and cultural contexts - are

essential to supporting circular transitions.

5. CONCLUSION

The analysis conducted in the study confirms that interest in this domain has grown significantly, particularly from 2020 onwards, with influential contributions published in journals such as *Journal of Cleaner Production* and *Business Strategy and the Environment*, and by authors like Mangla, Bag, and Subramanian. Emerging themes identified include the integration of digital technologies (e.g., industrial robots), circular entrepreneurship, and heightened focus on performance metrics, inclusion, and decent work, highlighting the evolving strategic role of HRM in circular and sustainable business models. Future research should continue to explore how HRM practices contribute to building resilient circular supply chains, inclusive and equitable workplaces, and effective talent management strategies aligned with circularity objectives. Particular attention is needed on how contextual factors - including sector-specific dynamics, regional conditions, technology readiness, digital training solutions, and workplace conditions - shape HRM's role in the adoption, diffusion, and long-term success of circular economy practices.

Limitations of this research include its exclusive reliance on the Scopus database, which, although comprehensive, may have excluded relevant studies published in other sources or in languages other than English. Furthermore, the study did not conduct a formal quality assessment of the included articles. As such, while the findings provide a broad overview of the field, they should be complemented by future systematic reviews

and empirical studies to validate and deepen understanding of the relationships identified.

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ЉУДСКИ РЕСУРСИ КАО СТРАТЕШКИ ПОКРЕТАЧ УСВАЈАЊА ЦИРКУЛАРНЕ ЕКОНОМИЈЕ: БИБЛИОМЕТРИЈСКА И ТЕМАТСКА АНАЛИЗА

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Извод

Овај рад представља свеобухватну библиометријску и тематску анализу 313 рецензираних чланака индексираних у Scopus-у, мапирајући пресек између циркуларне економије (ЦЕ) и људских ресурса (eng. human resources - HR). Студија потврђује централну улогу људских ресурса у омогућавању усвајања и ширења пракси ЦЕ у свим индустријама и регионима. Наши налази истичу да успех иницијатива ЦЕ не зависи само од технолошког напретка и структурних промена, већ и од спремности, ангажовања и добробити радне снаге. Кључне праксе људских ресурса – укључујући развој вештина, неговање лидерства, дигиталну и виртуелну обуку и инклузивно управљање талентима – показале су се виталним за опремање запослених способностима потребним за спровођење циркуларних стратегија. Анализа открива све већи значај интеграције дигиталних технологија, као што су алати Индустрије 4.0, са развојем људског капитала, а истовремено наглашава потребу за подржавајућим условима рада, укључујући безбедна, праведна и инклузивна радна места, како би се стимулисало одрживо понашање. Студија идентификује 15 тематских кластера и истиче нове теме као што су дигитална циркуларна економија, циркуларно предузетништво и достојанствен рад. Овај рад доприноси разумевању стратешке улоге управљања људским ресурсима у циркуларним транзицијама и предлаже правце за будућа истраживања контекстуалних фактора, дигиталне спремности и улоге људских ресурса у унапређењу циркуларних пословних модела на глобалном нивоу.

Кључне речи: циркуларна економија, управљање људским ресурсима, вештине, обука, ангажовање

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