

Modernization of HR Operating Models and Digital Delivery Gaps: A Bibliometric Study

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ABSTRACT

This study does an extensive bibliometric analysis to delineate the research environment about the modernization of human resource (HR) operational paradigms and the increasing deficiencies in digital service delivery. The analysis utilizes Scopus-indexed data and employs VOSviewer and Bibliometrix R to investigate publication trends, topic clusters, intellectual structures, author and institutional collaboration networks, and patterns of international co-authorship. The findings indicate two primary study domains: a well-established corpus of socioeconomic and macroeconomic literature, and a swiftly growing sector centered on HRM, digital information systems, and workforce development. Keyword co-occurrence and density maps reveal a distinct theme transition from population and economic studies to digital human resource management and training-related subjects. Simultaneously, national and institutional networks recognize China and the Russian Federation as prominent centers for collaboration. The research enhances the theoretical synthesis of socioeconomic and human resource modernization viewpoints while providing pragmatic insights for firms seeking to bolster digital HR competencies. The constraints and prospects for subsequent research are also examined.

Keywords: Human Resource Management, HR Operating Models, Digital HRM, Bibliometric Analysis, VOSviewer, Digital Transformation, Workforce Development, Socioeconomic Factors, Collaboration Networks, Scopus.

1. INTRODUCTION

The modernization of human resource (HR) operating models has become a strategic necessity for firms aiming for competitiveness in an increasingly digital and unstable environment. In the past decade, Human Resource Management has transitioned from conventional administrative roles to technology-driven, agile, and employee-focused frameworks [1]. Contemporary HR operating models prioritize integrated talent ecosystems, data-informed decision-making, digital workflows, and employee experience platforms, highlighting the increasing expectation for HR to serve as a proactive business partner rather than a passive support function [2]. As a result, the discourse on modernization has expanded to include agility, service design, continuous value delivery, and the capacity of HR to facilitate organizational transformation.

Technological innovations have significantly expedited this shift. The implementation of cloud-based HR information systems, artificial intelligence in recruitment, robotic process automation (RPA) in HR administration, and digital learning ecosystems has transformed the structure and provision of HR services [3]. Digital platforms, including self-service applications, employee experience dashboards, and integrated People Analytics tools, have enhanced HR responsiveness and scalability [4]. Notwithstanding these advancements, numerous firms encounter difficulties in attaining comprehensive digital delivery integration owing to disjointed systems, cultural opposition, inadequate HR digital skills, and insufficient cross-functional collaboration [5]. These discrepancies frequently result in a divergence between modernization objectives and actual digital HR efficacy.

Global upheavals have underscored the imperative to modernize HR operational methods. The COVID-19 epidemic compelled firms to swiftly restructure their HR value chains, establish remote work systems, utilize digital collaboration platforms, and improve digital performance monitoring tools [6]. This abrupt change underscored the necessity for flexible, robust, and digitally empowered HR processes that can maintain worker continuity during crises. As hybrid and remote work models proliferate, firms increasingly necessitate HR frameworks that provide flexibility, digital integration, and real-time data streams [7]. These modifications have amplified academic discourse regarding resilience, employee experience, digital governance, and the prolonged development of HR ecosystems.

A vital aspect of HR modernization pertains to the convergence of human and technical competencies. Despite the potential of digital tools to boost efficiency and decision-making quality, their deployment is significantly dependent on the digital literacy of HR professionals and their readiness to embrace new technology [8]. Research indicates that in the absence of appropriate skills, even sophisticated technologies fail to provide anticipated value, resulting in obstacles rather than enhancements [9]. Ethical considerations—data privacy, algorithmic fairness, and transparency in AI-driven decision-making—complicate modernization initiatives [10]. As firms implement AI and data-driven HR solutions, it is crucial to manage ethical issues to uphold trust, legitimacy, and compliance.

Notwithstanding considerable attention, scholarly inquiry into HR digital transformation and the modernization of operating models remains disjointed. Research emerges from various disciplines, including strategic HRM, information systems, organizational behavior, and digital innovation, frequently employing inconsistent terminologies [2]. Terms like “digital HR,” “People Analytics,” “HR operating model redesign,” and “employee experience platforms” are often utilized without well-defined conceptual limits, resulting in ambiguity. Furthermore, research predominantly emphasizes certain HR technologies or discrete HR tasks instead of providing a comprehensive overview of modernization along the full HR value chain [11]. This dispersion highlights the necessity for a thorough synthesis of worldwide academic output to discern intellectual frameworks, subject groupings, and the progression of research trajectories in HR modernization.

While the modernization of HR operating models is broadly acknowledged as a strategic imperative, the current academic research is fragmented, theoretically inconsistent, and deficient in a cohesive comprehension of digital delivery deficiencies. Recent studies indicate inconsistent definitions, uneven representation of digital HR services, inadequate examination of capability deficiencies, and minimal investigation into obstacles to cohesive digital implementation [5]. As a result, corporations encounter challenges in connecting modernization strategies with empirical evidence or theoretical frameworks. A comprehensive knowledge map delineating predominant themes, intellectual connections, or research gaps in digital HR delivery is absent. This gap underscores the necessity for a comprehensive bibliometric analysis that delineates the global research landscape concerning HR operating model modernization and digital delivery difficulties.

This study intends to provide a thorough bibliometric analysis to delineate the evolution, intellectual framework, and theme clusters of research concerning the modernization of HR operating models and digital delivery deficiencies. The study aims to: (1) analyze publication trends, prominent authors, and leading journals; (2) identify significant thematic clusters pertaining to HR digital transformation, contemporary HR operating models, People Analytics, employee experience, and challenges in digital delivery; (3) investigate scientific networks via co-citation, co-authorship,

and keyword co-occurrence analyses; and (4) elucidate existing gaps and suggest future research trajectories. This study systematically maps scholarly output to enhance knowledge of the modernization of HR operating models, identify persistent digital delivery gaps, and guide future research in fostering agile, digitally mature HR ecosystems.

2. METHODS

This study utilized a quantitative bibliometric approach to carefully delineate the intellectual framework, theme progression, and publication patterns concerning the modernization of HR operational paradigms and digital delivery deficiencies. Bibliometric analysis was chosen for its capacity to objectively assess extensive scientific literature and to uncover trends in authorship, conceptual evolution, and knowledge frameworks [12]. Scopus functioned as the principal data source owing to its extensive coverage of high-caliber peer-reviewed papers in human resource management, digital transformation, and organizational studies [13]. The search approach was systematically optimized through the iterative application of controlled keywords and Boolean combinations, incorporating terms such as “HR operating model,” “digital HR,” “HR digital transformation,” “e-HRM,” “People Analytics,” and “digital delivery gaps.” The search was limited to publications, conference papers, and reviews published in English from 2000 to 2024, a timeframe during which digital HRM and contemporary HR operational models have notably advanced.

The data extracted from Scopus was subjected to a methodical cleansing procedure prior to analysis. In accordance with established protocols in bibliometric research [14] duplicates, incomplete records, and irrelevant documents were eliminated via manual examination of titles and abstracts. Standardization protocols were executed on the bibliographic fields—such as author names, journal sources, affiliations, and keywords—to eradicate errors in spelling or formatting that could skew network computations. The sanitized dataset was examined utilizing the Bibliometrix R package and its Biblioshiny interface [15], which facilitated descriptive analysis of yearly scientific output, citation metrics, predominant sources, and authorship trends. These methods facilitated the recognition of historical evolution and major contributors within the discipline.

The study employed VOSviewer to develop networks of co-authorship, co-citation, and keyword co-occurrence in order to examine the intellectual and thematic frameworks of the area [16]. The clustering algorithm of VOSviewer facilitated the display of conceptual clusters pertaining to HR digital transformation, HR operating model redesign, People Analytics, employee experience, and problems in digital delivery. The analysis of proximities and link strengths elucidated the evolution of research themes throughout time. Thematic maps, strategic diagrams, and trend topic assessments produced by Bibliometrix provided enhanced understanding of the developmental pathways of research streams and emerging subjects. Collectively, these methodologies provide a stringent, transparent, and reproducible framework for examining the global bibliometric landscape of HR modernization research.

3. RESULTS AND DISCUSSION

3.1 Network Visualization

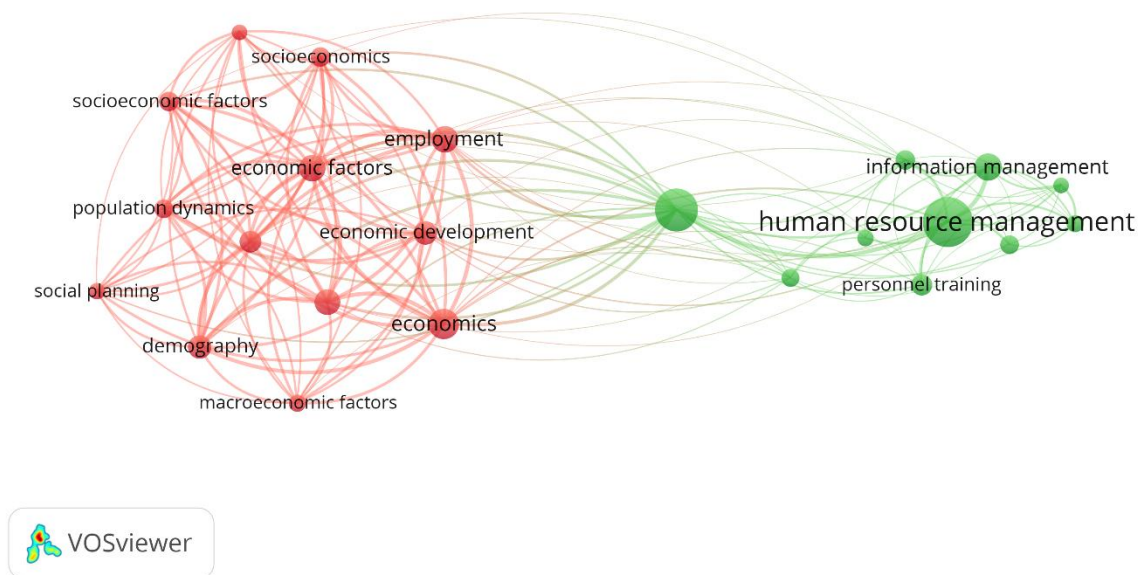


Figure 1. Network Visualization

Source: Data Analysis Result, 2025

The VOSviewer map depicts the keyword co-occurrence network graphic distinctly delineates two principal topic clusters: the socioeconomic–macroeconomic research cluster (red) on the left and the human resource management–organizational development cluster (green) on the right. The spatial distinction among these clusters suggests that, although they pertain to interconnected domains, they have historically developed as relatively autonomous bodies of literature. The red cluster focuses on socioeconomic aspects, economic development, employment, population dynamics, macroeconomic factors, and demography. The keywords indicate a significant focus on overarching structural dynamics that influence labor markets, national development, and economic conditions, mirroring macro-level analysis typically encountered in development economics, labor economics, and social policy.

Conversely, the green cluster is centered on human resource management, personnel training, information management, and other micro-level organizational issues. The prominence of "human resource management" within this cluster underscores its function as the intellectual foundation for research on workforce planning, HRM systems, skill enhancement, and organizational processes. The inclusion of information management within the same cluster highlights the growing integration of digital technology, data management, and knowledge management in HR practices. This indicates that the HRM literature offered here encompasses not only conventional personnel practices but also includes contemporary subjects such as digital HRM, competency enhancement, and HR information systems.

A significant feature of the representation is the existence of robust linking lines between the two groups. The connections—especially those arising from employment, economics, and economic development—illustrate that socioeconomic circumstances profoundly impact HRM research. The intermediary function of these terms signifies that employment outcomes and economic frameworks serve as conceptual conduits linking macro-level socioeconomic research with organizational-level human resource management techniques. Consequently, elements such as national economic expansion, labor market fluctuations, and demographic transformations are intrinsically

linked to organizational issues regarding workforce availability, skill enhancement, training, and human resource planning.

The direction of conceptual impact shown by the network is also notable. The dense red sub-network indicates that socioeconomic drivers—including demographic shifts, social planning, and economic variables—form essential knowledge that influences HRM goals. Demographic shifts and socioeconomic inequalities may compel firms to reevaluate their HR development strategies, reskilling initiatives, or employment regulations. Simultaneously, the internal density of the green cluster underscores a specialized and emerging field of HRM that leverages these macro-level insights to formulate organizational interventions, training systems, and HR strategies customized to particular workforce requirements.

The network suggests a scholarly domain in which macro-level socioeconomic study and micro-level HRM practices are becoming progressively intertwined. Although they remain separate clusters, the increasing number of interconnecting linkages indicates a trend towards interdisciplinary integration. As global challenges—including workforce shortages, technological disruption, demographic aging, and economic instability—escalate, researchers are increasingly in vestigating the influence of social dynamics on HR decisions and the potential of HRM advances to foster broader economic development. Consequently, the graphic illustrates an evolving research landscape that connects structural socioeconomic issues with organizational human resource initiatives, embodying a comprehensive grasp of labor system evolution.

3.2 Overlay Visualization

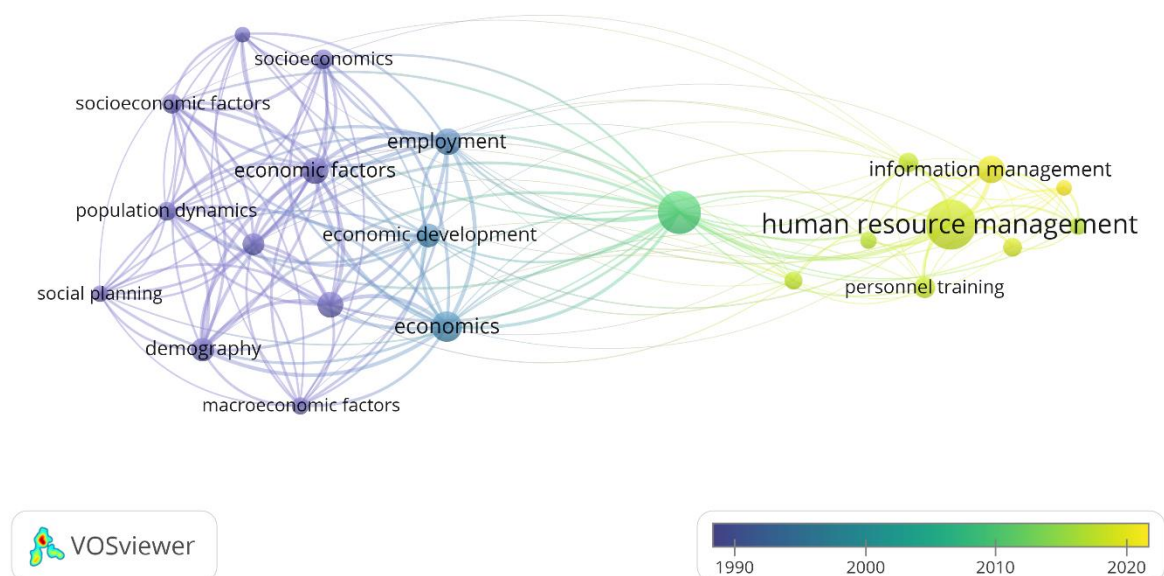


Figure 2. Overlay Visualization

Source: Data Analysis Result, 2025

The overlay visualization illustrates a distinct chronological progression from earlier socioeconomic and macroeconomic themes on the left (depicted in darker blue and purple hues) to more contemporary organizational and HRM themes on the right (represented in green and yellow). The darker nodes—namely socioeconomics, economic variables, demography, population dynamics, and macroeconomic factors—suggest that foundational work within this network commenced in the 1990s and early 2000s. During this period, study focused extensively on

comprehending overarching social structures, demographic shifts, and macroeconomic dynamics influencing labor markets and national growth. These issues embody enduring academic debates in development economics and social policy that established the intellectual groundwork for subsequent organizational breakthroughs.

As the timeline advances toward the mid-2000s and early 2010s, the map illustrates a transition from macro-level constructions to themes such as employment, economic development, and general economics, shown in teal and green tones. These subjects serve as conceptual links that integrate structural socioeconomic study with organizational issues. This transitory zone indicates that scholars have increasingly examined how macroeconomic changes—such as globalization, labor market restructuring, and economic growth—directly affect organizational workforce strategies. The bridging function of employment underscores its significance as both a socioeconomic result and an organizational resource, emphasizing its relevance across several fields.

The latest topics, highlighted in yellow, concentrate on human resource management, information management, and staff training. These terms signify recent study from the 2010s to 2020s, highlighting the increasing focus on digital HRM, workforce development, and knowledge management in enterprises. Their vivid yellow hue signifies that HRM has evolved into a dynamic and burgeoning research frontier, particularly as firms adjust to technological advancements, digitalization, and evolving workforce demands. The robust associations between HRM and previously socioeconomic themes demonstrate a contemporary multidisciplinary framework in which demographic changes, economic variables, and social structures persistently influence HR practices. The visualization illustrates a distinct chronological evolution: from fundamental socioeconomic studies to comprehensive employment-oriented study, culminating in modern topics of HRM and digital workforce development.

3.3 Citation Analysis

The bibliometric study revealed numerous highly referenced works that have profoundly influenced the intellectual framework of research in resource management, human resource systems, technology adoption, and socioeconomic development. These documents illustrate a multidisciplinary framework encompassing rural development, machine learning, decision assistance, information technology adoption, and cross-cultural human resource management transfer. Displaying the most referenced works enables scholars to comprehend which studies have significantly influenced core theories, methodological advancements, and conceptual frameworks in the discipline. Table 1 delineates the 10 most impactful documents according to citation frequencies obtained from the Scopus database.

Table 1. The Most Impactful Literatures

Citations	Authors and year	Title
526	Long, H., Tu, S., Ge, D., Li, T., Liu, Y.	The allocation and management of critical resources in rural China under restructuring: Problems and prospects.
312	Johnson, A.E.W., Ghassemi, M.M., Nemati, S., ... Clifton, D., Clifford, G.D.	Machine Learning and Decision Support in Critical Care
262	Murphy, R.	Turning Peasants into Modern Chinese Citizens: "Population Quality" Discourse, Demographic Transition and Primary Education.
115	Von Glinow, M.A., Teagarden, M.B.	The transfer of human resource management technology in Sino-U.S. cooperative ventures: Problems and solutions
110	Chen, J., Askin, R.G.	Project selection, scheduling and resource allocation with time dependent returns
107	Kannabiran, G.	Enablers and inhibitors of advanced information technologies adoption by SMEs: An empirical study of auto ancillaries in India

Citations	Authors and year	Title
100	Spanos, Y.E., Prastacos, G.P., Poulymenakou, A.	The relationship between information and communication technologies adoption and management.
87	Meyer, R., Hammerschmid, G.	The degree of decentralization and individual decision making in central government human resource management: A European comparative perspective.
74	Linzner, R., Lange, U.	Role and size of informal sector in waste management a review.
72	Hays, S.W., Kearney, R.C.	Anticipated changes in human resource management: Views from the field.

Source: Scopus, 2025

The citation distribution illustrates the variety and extent of academic contributions within the dataset. [17] research on resource allocation in rural China serves as the primary intellectual foundation, emphasizing the impact of macro-level restructuring and resource governance on development results. [18] present a divergent yet equally important technological aspect through machine learning applications in critical care, demonstrating the interdisciplinary significance of data-driven decision systems. Simultaneously, [19] sociological analysis of population quality and education demonstrates the persistent impact of demographic shifts on human capital advancement. In the field of Human Resource Management, the works of [20] and [21] highlight the essential influence of cross-cultural HRM transfer and decentralization on administrative and organizational performance. Research on technology adoption, including works by [22], [23] , emphasizes the significance of ICT readiness, organizational competency, and strategy alignment in facilitating modernization. Ultimately, studies concentrating on waste management [24] and HRM viewpoints from practitioners [25] exemplify the extensive contextual applications of resource management and HR transformation across both formal and informal sectors.

3.4 Density Visualization

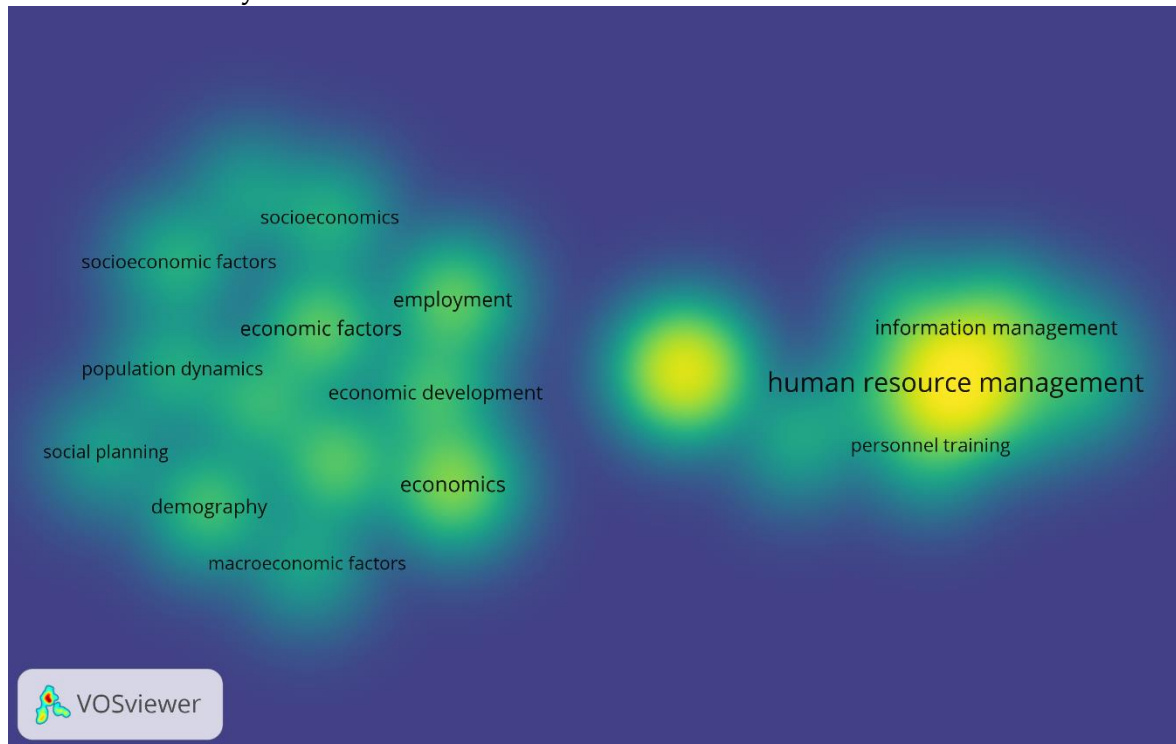


Figure 3. Density Visualization

Source: Data Analysis Result, 2025

The density graphic illustrates map indicates two primary areas of intellectual concentration. A thick green-yellow area on the left encompasses themes including socioeconomics, economic variables, population dynamics, economic development, employment, and demography. The warmer hues in this region signify a high frequency and robust co-occurrence of socioeconomic and macroeconomic phrases, indicating that this thematic cluster is a fundamental knowledge base within the dataset. These concepts jointly encapsulate studies on the influence of demographic transitions, structural economic pressures, and social planning on labor markets and country development trajectories. The extensive distribution of green hues within this cluster indicates that these subjects are highly interrelated and have been persistently analyzed in numerous publications, underscoring their importance as enduring, well-established concerns.

A second vibrant yellow cluster emerges on the right side of the picture, encompassing human resource management, information management, and people training. This hotspot signifies a region of significant contemporary research engagement, suggesting that HRM and digital information systems have emerged as crucial subjects within the dataset. The prominence of the yellow region indicates a robust academic focus on contemporary HR strategies, digital transformation, and skills enhancement inside enterprises. In contrast to the broader socioeconomic cluster, the HRM cluster is more confined, indicating a more specific and recently developed study emphasis. The two clusters collectively depict the structure of the field: a comprehensive, historically significant foundation of socioeconomic studies that informs a more concentrated, swiftly expanding domain of study on HRM, workforce development, and digital organizational practices.

3.5 Co-Authorship Network

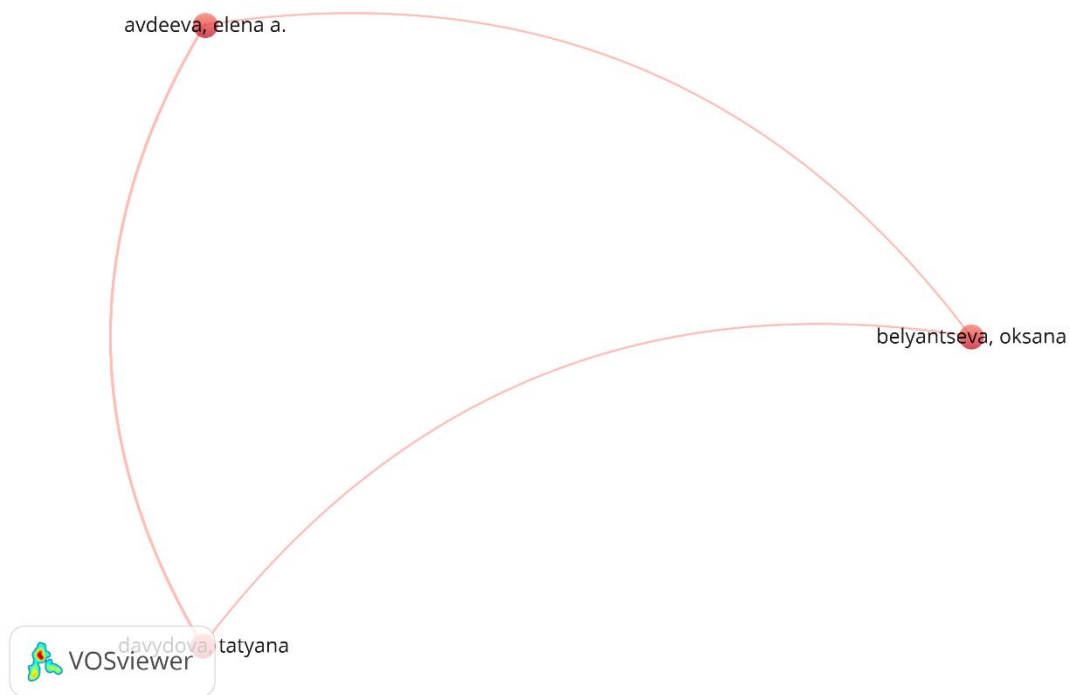


Figure 4. Author Visualization

Source: Data Analysis Result, 2025

The VOSviewer co-authorship network visualization depicts a compact, closely linked cluster including three authors: Avdeeva, Elena A., Belyantseva, Oksana, and Davydova, Tatyana. The slender yet distinct connecting lines signify that these writers have engaged in direct collaboration, establishing a closed triangle co-authorship framework. This indicates a concentrated research collaboration, perhaps yielding several co-authored publications within the dataset. The network's restricted size and absence of connections to other authors suggest that this group operates largely autonomously, without extensive collaboration among institutions or research networks. Although their co-authorship intensity seems limited, as denoted by the light red hue, the persistent associations among the three signify a sustained research link, potentially indicating a niche or burgeoning academic community within the discipline.

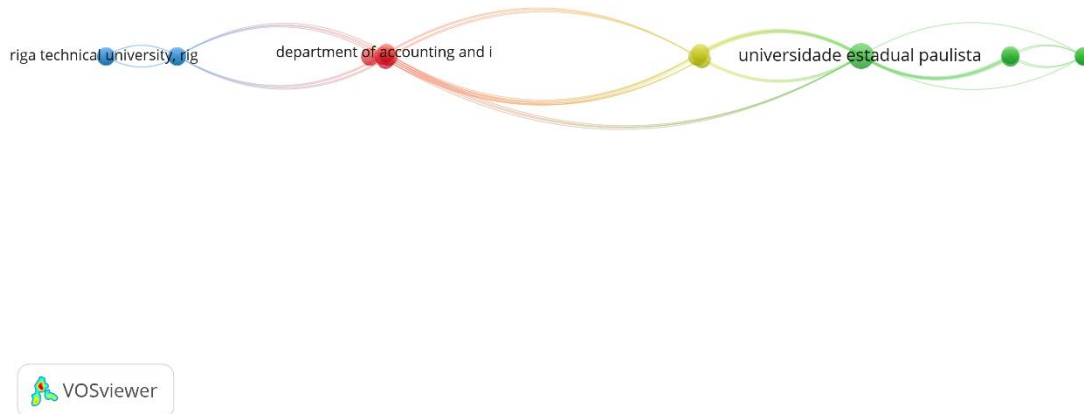


Figure 5. Affiliation Visualization

Source: Data Analysis Result, 2025

The VOSviewer affiliation-network visualization reveals a linear and loosely connected collaboration framework among several institutions, signifying a modest yet significant pattern of cross-institutional research engagement. The core of the network is the “Department of Accounting and Information,” which serves as a pivotal connecting point among institutions from various locations. On the left side, it establishes a concise bilateral collaboration channel with Riga Technical University. On the right side, it links to Universidade Estadual Paulista, which then connects to more connected units within its institutional network. The color gradient—from blue (indicating older publications) to green and yellow (representing more recent collaborations)—indicates that partnerships with Riga Technical University are older, but recent research activity is predominantly centered around Universidade Estadual Paulista. The visualization reveals that the collaboration network is narrow and linear, rather than dense or multi-clustered, underscoring the existence of a central department that facilitates international academic cooperation between European and South American institutions, particularly in the fields of accounting and information research.

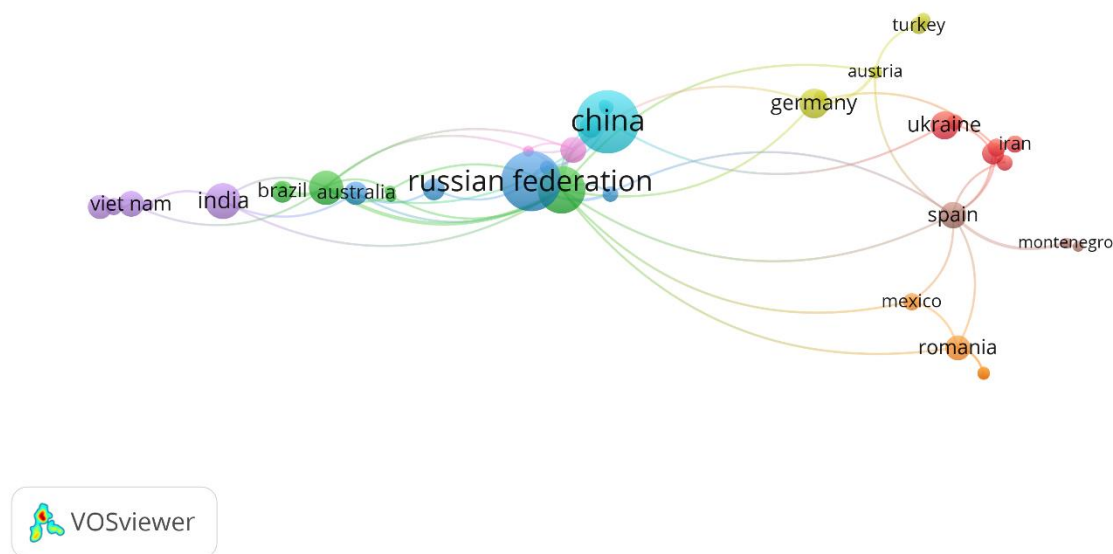


Figure 6. Country Visualization

Source: Data Analysis Result, 2025

The VOSviewer country-coauthorship visualization identifies Russia and China as the principal centers of international collaboration, as indicated by their substantial node sizes and numerous connecting links. These nations function as the principal conduits linking various regional research networks. On the left side of the globe, Russia's partnerships encompass nations such as Australia, Brazil, India, and Vietnam, creating a cluster of emerging and developing economies with increasing research involvement. The color gradient and node sizes indicate a moderate yet consistent degree of co-authored work, with Russia serving as a primary coordinating hub within this group.

China exhibits robust working relationships with Germany, Austria, Turkey, and notably Ukraine, creating a more heterogeneous international coalition that encompasses Europe and Asia. Simultaneously, Spain, Iran, Romania, and Mexico function as secondary hubs interconnected via China or Ukraine, rather than establishing direct links throughout the entire network. The existence of minor nodes like Montenegro signifies sporadic yet significant involvement in global coauthorship. This map depicts a spatially multi-centered research landscape, with Russia and China as the central anchors, while adjacent countries constitute peripheral yet interconnected clusters. The visualization illustrates regional academic partnerships and the pivotal influence of significant scientific economies in creating international research collaboration.

Discussions

Practical Implications

This bibliometric research yields significant practical implications for policymakers, HR leaders, and organizational strategists aiming to update their HR operational models. The study emphasizes the necessity of aligning HR strategies with overarching demographic, economic, and technological trends by finding theme clusters that link socioeconomic dynamics to company HR practices. The pronounced emphasis on digital HRM, information management, and employee training indicates that firms must allocate resources towards digital infrastructure, data-centric HR systems, and workforce development to maintain competitiveness. Furthermore, the worldwide

collaboration networks reveal that research is becoming progressively global, highlighting potential for firms to assess global best practices, establish cross-border HR partnerships, and implement universal standards in digital workforce management. Co-authorship and institutional network insights assist universities, research institutions, and HR departments in identifying prospective partners and nascent centers of excellence in HR modernization. The report provides practitioners with an evidence-based framework to address digital transformation concerns and improve organizational resilience.

Theoretical Contributions

This work theoretically enhances the literature by providing a thorough synthesis of the evolution of HR modernization research across several scientific fields. The bibliometric maps indicate that the field is influenced by the interaction of macro-level socioeconomic issues and micro-level organizational HR practices, hence reinforcing and expanding the multilevel perspective in HRM theory. The study clearly illustrates the chronological evolution from fundamental socioeconomic research to modern investigations in digital HRM and workforce analytics, thereby enhancing theoretical discourse on the impact of external structural conditions on organizational HR innovations. The identification of key elements such as human resource management, information management, and employment as connecting nodes reinforces the theoretical assertion that HR systems function within larger demographic and economic ecosystems. The network structures provide novel conceptual avenues for merging digital transformation frameworks (such as socio-technical theory and capability-based view) with HR operating model research, thereby enhancing the creation of a more comprehensive theoretical framework for comprehending digital HR maturity.

Limitations

Notwithstanding its merits, this study possesses numerous drawbacks that warrant acknowledgment. The analysis is exclusively based on Scopus-indexed publications, potentially omitting pertinent studies from databases like Web of Science, Google Scholar, or regional journals, hence restricting the comprehensiveness of the global knowledge landscape. Secondly, bibliometric approaches discern trends and structural linkages; but, they do not evaluate the qualitative depth, methodological rigor, or contextual importance of individual research. Consequently, interpretations derived from co-occurrence or co-authorship maps may trivialize intricate theoretical or empirical subtleties. The visualization results are contingent upon keyword changes, data cleansing methodologies, and threshold configurations, indicating that differing parameter selections may yield distinct network architectures. The report ultimately presents a macro-level overview but fails to clearly examine causal links or provide comprehensive case evaluations of HR modernization procedures. These constraints present avenues for future study to combine bibliometric findings with systematic literature reviews, qualitative assessments, and empirical validation studies.

CONCLUSION

This bibliometric analysis offers an extensive overview of the intellectual, conceptual, and collaborative dimensions related to research on the modernization of HR operating models and the identified deficiencies in digital service delivery. The study demonstrates that the field is influenced by two primary knowledge streams: established socioeconomic and macroeconomic research, and a more contemporary, swiftly growing body of work focused on human resource management, digital information systems, and workforce development, through the integration of co-occurrence, co-authorship, country collaboration, and density visualizations. The progression of themes—from fundamental research on population dynamics, economic influences, and employment to current focal points like digital HRM, information management, and personnel development

illustrates that HR modernization is intricately linked to wider societal and technological changes. The analysis indicates that worldwide research collaboration is centered around pivotal countries like China and the Russian Federation, which serve as significant hubs linking diverse regional clusters. Likewise, author and institutional networks reveal concentrated but limited collaboration patterns, indicating potential for expanded cross-institutional and international relationships. These observations highlight the strategic significance of promoting global and multidisciplinary collaboration to progress the subject. This study provides significant empirical information regarding the evolution of HR operating models in response to demographic changes, economic transformations, and digital revolution. The results underscore the imperative for firms to cultivate digitally proficient HR ecosystems, provide resources for staff upskilling, and incorporate data-driven methodologies to improve service delivery. The work presents substantial theoretical and practical contributions, while simultaneously recognizing the methodological constraints inherent in bibliometric research. Future research may enhance these insights by integrating bibliometric methods with systematic literature reviews, qualitative analysis, or empirical case studies to elucidate the intricate contextual nuances of HR modernization and digital readiness.

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