

# Artificial intelligence as an enabler for achieving human resource resiliency: past literature, present debate and future research directions

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## Abstract

**Purpose** – Artificial intelligence (AI) can enhance human resource resiliency (HRR) by providing the insights and resources needed to adapt to unexpected changes and disruptions. Therefore, the present research attempts to develop a framework for future researchers to gain insights into the actions of AI to enable HRR.

**Design/methodology/approach** – The present study used a systematic literature review, bibliometric analysis, and network analysis followed by content analysis. In doing so, we reviewed the literature to explore the present state of research in AI and HRR. A total of 98 articles were included, extracted from the Scopus database in the selected field of research.

**Findings** – The authors found that AI or AI-associated techniques help deliver various HRR-oriented outcomes, such as enhancing employee competency, performance management and risk management; enhancing leadership competencies and employee well-being measures; and developing effective compensation and reward management.

**Research limitations/implications** – The present research has certain implications, such as increasing the HR team's proficiency, addressing the problem of job loss and how to fix it, improving working conditions and improving decision-making in HR.

**Originality/value** – The present research explores the role of AI in HRR following the COVID-19 pandemic, which has not been explored extensively.

**Keywords** Artificial intelligence, Human resources, Resiliency, Employee engagement, Performance, Big data analytics

**Paper type** Literature review

## 1. Introduction

Every aspect of a business is affected by the pandemic's sudden spread and the shifting cultural climate. Human resource management (HRM) practices in all businesses have been



affected by the epidemic in many ways (Ngoc Su *et al.*, 2021). In his study, Alonso-Muñoz *et al.* (2022) explained how resilience helps individuals, communities and nations adapt to change by strengthening their ability to deal with adversity. As COVID-19 has disrupted many business processes and operations, strengthening human resource resilience (HRR) practices may provide several options for dealing with the crisis and creating practical solutions. Most importantly, as Lengnick-Hall *et al.* (2011) said, businesses may bring resilience and possess the capability to establish an attitude to grasp changes if they proactively manage human resources and develop competencies. According to Mitsakis (2020), in times of uncertainty, companies must take different individual and collective resilience measures to ensure that they can stand firm in the face of shocks and meet their unique needs. Furthermore, Lu *et al.* (2023) discussed that sustainable human resource practices have a close relationship with work engagement, which positively affects employee resilience and contributes to employee-being measured.

According to Dirani *et al.* (2020), fundamental leadership qualities are vital to support responding to the crisis in diverse circumstances and are reflections to explore new roles and changes needed in companies. Similarly, Roumpi (2021) found that the pandemic's emergence has influenced many flexibility-oriented human resource strategies, which may lead to more practical solutions and suggestions for businesses. It has been suggested by Azadeh *et al.* (2018) that workers' ability to think critically is one of the most important factors in building a strong HRM system. Ngoc Su *et al.* (2021) discussed that a proper set of HR practices consistently drives employees to understand and prioritize tasks and focus on handling organizational processes. Jotaba *et al.* (2022) stated that four aspects are very important in human resource management: organizational factors for success, learning management and human behavior strategic HRM, which focuses on developing innovative practices through organizational excellence. Agarwal (2022) stated that AI adoption basically depends on certain prerequisites, such as organizational preparedness, technical expertise, and perceived benefits. Pan and Froese (2023) concentrated on stating that AI can be closely connected to understanding different aspects of job and labor markets that can result in multiple benefits for organizations and framing management policies.

To move the HRR forward, it is crucial to strengthen the organization's problem-solving capacity via the skillful application of relevant knowledge, hence enhancing its current informational prowess (Hamouche, 2021). To the degree that AI-enabled technology is considered, recent research has shown that its application delivers solutions by fostering employee involvement and enhancing innovation strategy to boost HRR (Chowdhury *et al.*, 2023). Bouaziz and Smaoui Hachicha (2018) explained that strategic HRM practices enhance the robustness of the firm and enhance the integrity and agility dimensions. According to Altemeyer (2019), employing AI helps eliminate prejudices in areas such as hiring and selection procedures, which in turn boosts cultural compatibility and employee diversity. Thite (2022) opined that technology-intensive platforms bring a paradigm shift in human resource operations and focus on delivering outwards results that can result in enhancing job performance, a supportive learning environment, and proactive change in organizational development practices. The same may be said about AI, which is an intelligent system that perceives its surroundings and takes actions to achieve desired achievements (Zeng, 2020). Ivanov (2023) developed a model that focuses on human well-being and sustainability as two major forces that are closely connected to a rising society. Technology practices can strongly detect changes and postulate ways to determine strength and implementation in the organizational context. He *et al.* (2023) stated that rapidly developing technology adaptive solutions and enabling transformative management practices can enable an organization to handle crises by identifying innovative practices for organizational growth and development. Swain *et al.* (2023) discussed that intellectual capacity is an important antecedent for adopting technological changes and enables a platform for continuous improvement. Sreenivasan and

Suresh (2022) stated that AI technology application significantly improves the innovation process and creates a channel for the optimum utilization of resources. Hence, rising access to powerful computing resources, innovative machine learning methods, and big data analytics are all expected to significantly expand the range of AI's practical applications in the coming years. As a result, experts in the field of human resources are starting to think about how emerging AI approaches can affect things such as job description creation, employee perks, performance reviews, employee attrition, and internal communication (Khan *et al.*, 2019). Consequently, the current research was carried out to examine the importance of AI in HRR in the postpandemic setting in light of the aforementioned literature studies. Academic practitioners and researchers were compelled by the rapid pace of change to complete a study that would provide sufficient ideas through the developed conceptual framework on the application of technology and develop strategies to meet exigencies as and when they were encountered by organizations.

The previous research taken into account in this study was conducted both before and after the COVID-19 pandemic, providing important evidence of AI in HRR. Understanding the significance of AI-based solutions to address problems in HRR that arise during or after post-COVID-19 disruptions is crucial. In light of researchers' current understanding, this study is the first effort to determine how AI affects HRR during or after the COVID-19 pandemic. The present study adopted a systematic review by collecting literature in the field of AI and HRR. The study used the Scopus database to extract the literature using the relevant keywords in AI and HRR. In the initial stage, approximately 114 articles were identified; after applying the inclusion/exclusion criteria, 98 articles were identified to perform the systematic review. The study adopted the clustering approach through a word cloud of keywords to identify the thematic areas. Second, identifying the thematic topics, the highly cited research works were reviewed. Third, visualization was performed to examine the current research trends in the fields of AI and HRR. Finally, a framework is proposed for future researchers to gain insights into the actions of AI to enable HRR.

The purpose of this study is to identify how the application of artificial intelligence provides multiple solutions and strategies to meet changing conditions and handle crises. Organizations should take the changing scenario into account and develop strategies that can mitigate the risk and build a strong workforce to cope with the requirement (Ngoc Su *et al.*, 2021). The present study, through a systematic review, seeks to obtain a deeper understanding of the role and application of artificial intelligence techniques that enhance AI-human resource practice integration. Enhancing skills and competencies can not only develop organizational growth strategies but also create a value-added human resource workforce for achieving excellence and understanding their relationships and implementations towards AI-enabled HR practices. Thus, based on the above-stated discussion, the outlined questions are formed to develop a framework for future research:

- RQ1. What specific AI technologies are relevant to developing HRR?
- RQ2. What research gap currently exists in the AI area that helps to develop HRR?
- RQ3. What framework of research in the AI area do HR experts need to pursue to develop HRR practices?

The research study contributes to the literature in various ways. First, it explores the literature studies to develop the critical themes of HRR by developing a keyword occurrence map of 98 articles through bibliometric visualization. Second, the findings of the study enable us to understand the infrastructure of the available literature. It tries to address the growing importance of the issue through bibliographic analysis of the HRR publications. Third, the article gives a much broader view to understand different aspects of human resource practices where artificial intelligence strengthens the outcome and focuses on achieving

desired results with a cost-effective framework. Fourth, by reviewing articles with high citation, researchers predominantly enumerated the knowledge gaps more deeply. Thus, we provided the ample scope to introduce upcoming researchers who are interested in this field for a better prospective. On the other hand, in regard to its practical contribution, the study and its results can benefit industrialists and policymakers in multiple ways. First, it acts as a yardstick that identifies the areas that are relevant and require proper attention with changing times (specifically in the post-COVID scenario). Second, through proper strategies, organizations and policymakers can develop training and development practices and proper employee motivational sessions to create a competitive workforce and handle challenges. Third, policymakers can develop a conducive ecosystem by creating employee engagement and employee experience practices.

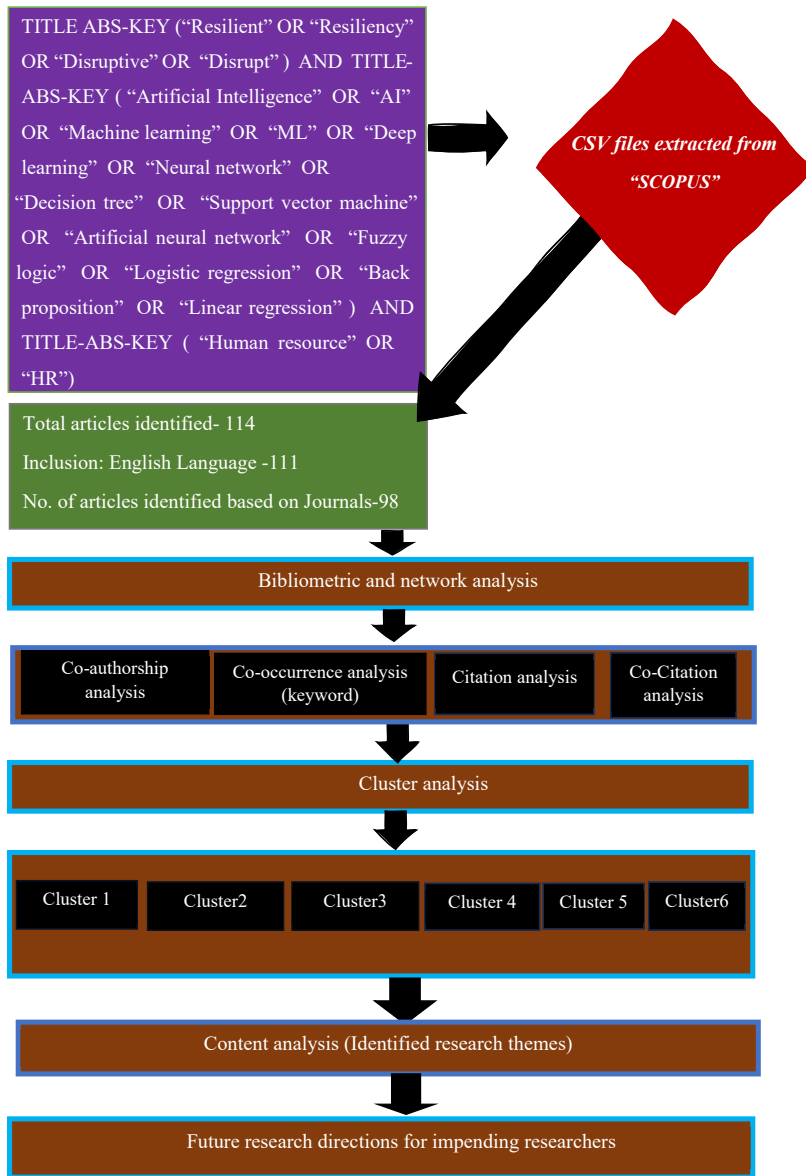
The present research work started with a review of the literature to answer the above questions. To generate the research themes and directions, a word cloud through clustering was employed. To analyze the current trend, a bibliometric analysis was carried out. Thus, a future framework was proposed for impending researchers to understand the application of AI techniques in HRR post-COVID-19. The consecutive sections of this article are as follows: section two discusses the background review, and the bibliometric study is discussed in section three, followed by the clustering approach and discussion on research themes. Section four presents the discussion and implications of the study. The conclusion is presented in section five, and finally, section six presents the limitations of the research work.

## 2. Background review

The methodology adopted in this research concentrated on gaining inclusive insight concerning previously conducted studies on HRR and AI. The articles emphasized a literature review that differentiates it from narrative reviews by adopting a reproducible, methodical, and transparent approach (Tranfield *et al.*, 2003). Considering the present situation, the published articles were collected from the SCOPUS database, as it is one of the largest data hubs consisting of a large number of peer-reviewed articles. SLR was used in the research by establishing keyword categories and performing article searches based on those categories (Vinodh *et al.*, 2021). Figure 1 depicts the methodology of the study. Moreover, the contributing researchers analyzed the methodology in a four-stage process. First, the retrieval of articles was performed based on specific keywords in the search string on HRR and AI. The next stage involved the visualization of the collected articles. For this purpose, VOSviewer software was used. After that, the clustering of keywords was performed, which led to the formulation of a word cloud map and the identification of the emerging research streams that facilitate the development of future research frameworks for impending researchers.

## 3. Bibliometric review

The current trends denote that bibliometric studies are gaining enormous popularity in the research field of business and management (Donthu *et al.*, 2021). Bibliometric analysis is a rigorous tool that is used to examine and analyze large volumes of scientific data (Moral-Muñoz *et al.*, 2020). VOSviewer is used to analyze the bibliometric data and develop network maps for data visualization (Samadhiya *et al.*, 2022). The changing research scenario enables us to comprehend the acceptance of bibliometric analysis due to the exhibition of its efficiency in handling huge quantities of systematic data and creating high research impact (Donthu *et al.*, 2021). Thus, Table 1 presents the imperative information of the identified research articles about HR resilience and artificial intelligence.



**Note(s):** Cluster 1: Data-driven techniques in HR models Cluster 2: AI and Employee management Cluster 3: Human resource management and disruptive technology Cluster 4: AI and resilience Cluster 5: Neural network and HRM Cluster 6: Risk management and AI

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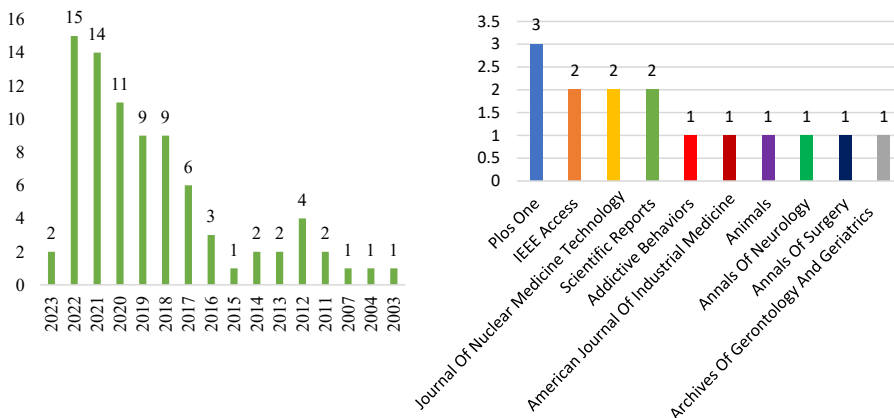
**Figure 1.**  
Research flow diagram

Description	Results
<i>Key statistics</i>	
Duration	2003–2022
Sources (Journals)	92
Papers	98
Average publication years wise	1
Average citations per article	11
References	4,998
<i>Document type</i>	
Article	92
Review	6
<i>Document contents</i>	
Keywords plus	1,798
Author's keywords	364
<i>Authors</i>	
Existence of authors	422
one-authored documents	522
multiple-authored documents	9
<i>Collaboration of authors</i>	
one-authored papers	9
<i>Document per author</i>	
Co-authors per papers	1
Collaboration index	2.0
<b>Source(s):</b> Created by authors	

**Table 1.**  
Key statistics on AI  
and HRR articles

### 3.1 Descriptive statistics

Publications on the basis of yearly statistics in human resource resilience and artificial intelligence are presented in Figure 2. The developed graph is based on a period of 16 years of statistics. Majorly, the researcher focused on identifying the trend for more than a decade. It signifies the contributing role of upcoming researchers and their interest in the research area. Thus, the annual data graph shows upwards momentum beginning in 2017 since this year's growth is quite stable when compared to the prior years. This indicates that the



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**Figure 2.**  
Yearly statistics with  
source details

awareness and interest related to the AI and HRR areas improved from 2017 onwards, and there is a need to conduct more research in the AI and HRR areas because less effort has been made to conduct research in the AI and HRR areas in previous years.

The source statistics are also enumerated and displayed in [Figure 2](#). The source details state that PLOS One journal is at the number one position with three articles. Next, IEEE Access, Journal of Nuclear Medicine Technology, and Scientific Reports are the three sources with the maximum contribution.

Furthermore, [Table 2](#) indicates that all the institutions are primarily from outside India; hence, Indian researchers can enter the field with quality studies and enrich the potential of contributing to the research area. Future researchers can analyze the research state and create a collaboration network through research work that can measure the HR areas that need substantial attention.

Some of the prominent authors identified during the bibliometric analysis are Arumugam, M., Balasubramanian, B., Chaudhury, S., Clark, D.B., and Kirisci, L. However, the contribution of prominent authors in terms of a number of publications are same for all authors, which indicates the ample scope in the field to contribute and authors can collaborate for developing vital research studies and gain insight into exploring the benefits and adding research studies through understanding the role and importance in the field of human resource resilience.

The word cloud keyword occurrence measures the frequency of keywords used in the research studies ([Naz et al., 2022](#)). The “word cloud” of the keywords is developed based on the title and abstracts of the articles and measures the most common words used in the existing research studies. The size of the word is considered in the word cloud map that represents the occurrence of the keyword in selected articles. [Figure 3](#) depicts that the keywords of this study are “human resources, HRR, learning technology, and AI, which lie at the center of the developed map”. It identifies the keywords that occurred numerous times in the recognized articles and were continuous throughout the research. Based on the word cloud map, [Table 3](#) discusses the keyword occurrence statistics.

The research fixed inclusion criteria; it considered the keywords that occurred two times in the data set. Out of the 364 identified keywords, 18 keywords were included with at least 2 occurrences of a keyword in the existing studies to develop the word cloud map. The country collaboration network map discussed identifying countries collaborating with other countries and developing maximum research studies. Out of the identified 48 countries, based on the stated criteria with a minimum of two documents and two citations, 19 countries were considered for further analysis. The United States, the United Kingdom, and India have contributed significantly to the research field of AI, and HRR has published many research studies in this area. Considering the network analysis, the United States, the United Kingdom,

Institution	Articles
“Harvard Medical School”	3
“Brigham and Women’s Hospital”	3
“Université McGill”	2
“Universitair Medisch Centrum Groningen”	2
“Johns Hopkins Bloomberg School of Public Health”	2
“Rijksuniversiteit Groningen”	2
“The University of British Columbia”	2
“Periyar University”	2
“University of Toronto”	2
“University College London”	2

**Table 2.**  
Institution details

**Source(s):** Created by authors





**Table 4.**  
Clustering of the  
word cloud

Clusters	Keywords
Data-driven techniques in HR models	Innovation, Assessment, Security, Computing, Digital, logic
AI and Employee management	Sector, Cognitive, framework, Predictive, and System
Human resource management and disruptive technology	Disruptive, Distributed, Employee, Health, Development, Safety
AI and resilience	Risk, Process, Structure, Break, External
Neural network and HRM	Pandemic, Information, Productivity, Privacy
Risk management and AI	Learning technology, Intelligence, Damage, Human, Occupational

**Source(s):** Created by authors

*3.2.1 Data-driven techniques in HR models.* In the dynamic working environment, and evidence-based facts are becoming more relevant, data-driven techniques are now becoming more popular and gaining immense attention. It provides various solutions that can enhance the efficiency measures of different HR practices. [Krista \(2016\)](#) stated that data-driven technologies could build strong support in different administrative operations and enhance the scope of the strategic decision-making process. [Li et al. \(2020\)](#) explained that the ability to focus on understanding employee competency as a tool to measure performance through data-driven methods expands the scope to identify the right people and performance and develop a transparent reward mechanism. [Verma et al. \(2021\)](#) discussed identifying that the application of data-driven technologies can focus on developing HR practices and enhancing HR service quality and innovation; thus, data-driven technologies can be a major yardstick to step ahead for accepting changes. Extending the work, [Yang et al. \(2021\)](#) explained that the role of data-driven techniques expanded to people-oriented human resource practices. The techniques can be effective for employee welfare, employee compensation, employee training, employee overtime, and the timeliness of transaction processing. [Liu et al. \(2022\)](#) opined that developing robust optimal solutions to handle HR practices can bridge the gap between the expected and reality, enabling a focus on innovative practices for better results. [Vahdat \(2022\)](#) discussed that in the outbreak of the pandemic, i.e. COVID-19 AI-enabled HRM practices focused on providing web-based applications, result-driven designs are the major outcome that progresses the implementation of HR policies. The above discussion provides a clear understanding that data-driven can be a boon for the optimum utilization of resources and developed advanced HR practices for employee management and welfare. Thus, the following future research questions are formulated for future researchers to expand the wing of research for contributing studies (see [Table 5](#)).

*3.2.2 AI and employee management.* AI and its subset techniques have expanded their wings in different operational activities of an organization. [Strohmeier and Piazza \(2015\)](#) stated that AI enables an understanding of the management of human resource requirements in relation to turnover prediction, and candidates with knowledge, sentiment analysis, and resume data extraction are the prime areas that undertake the exploration of the technique. Various disruptions have been faced during COVID-19, which has led to numerous challenges in staffing, performance management, and training practices ([Hamouche, 2021](#)), and the application of AI has led to the formulation of effective measures to handle disruptions and mitigate risks. [Jai et al. \(2018\)](#) elaborated a conceptual model that can be implemented to understand the implications for human resource strategy and planning, recruitment, training and development processes, performance management, salary evaluation, and employee relationship management. [Abdeldayem and Aldulaimi \(2020\)](#) discussed that the application of AI enables the formation of a digitally transformed work environment that will be helpful in dealing with an inconsistent environment. [Park et al. \(2022\)](#) discussed identifying how

Major talk of the theme	Future research questions (FRQ)
How can data-driven techniques improve the HR practices within the firm?	<p><i>FRQ1:</i> Is the company taking any steps towards using data-driven methods to develop its recruiting strategies?</p> <p><i>FRQ2:</i> What data-driven methods may be used to boost the morale of the workforce?</p> <p><i>FRQ3:</i> How can we best structure an HR model using AI methods to maximize the efficiency with which HR activities produce outcomes in the wake of the COVID-19 pandemic?</p> <p><i>FRQ4:</i> How can we use new technologies like AI, machine learning (ML), blockchain (blockchain ledgers), etc., to rebuild HR after a pandemic?</p> <p><i>FRQ5:</i> How can we use AI to be more proactive in HR efforts rather than reactive?</p> <p><i>FRQ6:</i> In regard to hearing what workers have to say, how might AI techniques help?</p> <p><i>FRQ7:</i> Which artificial intelligence techniques can help make better personnel choices?</p>

**Source(s):** Created by authors

**Table 5.**  
Future research questions drawn from cluster 1 for future research studies

artificial intelligence-enabled applications can enable a focus on divergent perspectives and a focus on scaling the resources for optimum results. Chowdhury *et al.* (2023) discussed identifying how artificial intelligence adoption created employee integration strategies and focused on developing core skills among employees to develop an efficient knowledge-based view. Thus, based on the stated discussion of the literature, it is clearly evident that artificial intelligence adoption led to the development of employee-centric measures, and it provides a valuable addition to exploring the resources to the maximum way and enhancing the competencies of employees to deal with the crisis. Hence, the stated discussion formulated future research questions for the impending researchers (see Table 6), which will add value to the existing research studies with new directions and analyze the benefits of the application of AI-enabled services in employee management and the field of HR.

*3.2.3 Human resource management and disruptive technology.* The changing technological innovations and increase in challenges to handle a diversified workforce. Disruptive technological innovations are a major strength in providing multiple options to work and integrate HRM functions and policies, such as areas of recruitment, legal work, monitoring employees, coaching, and performance management (Stanley and Aggarwal, 2019; Kumari *et al.*, 2019). Mrowinski *et al.* (2021) discussed a framework such as autonomous task-performing technology, which speculates on present and future employment requirements and develops policies to understand the impact on the labor market for better practices. The study by Priyashantha (2022) stated that the use of disruptive technologies mainly depends on electronic HRM and communication technology. Although the literature enumerates the benefits of disruptive technologies on human resource management, there are many streams that require rigorous discussion and development of studies to deeply understand the scope of the techniques. Hence, the stated discussion formulated future research questions for impending researchers (see Table 7), which will add value to the existing research studies with new directions and analyze the benefits of the application of disruptive technologies in the field of HRM.

*3.2.4 AI and resilience.* In their study, Liu *et al.* (2019) discussed that understanding resilience from different perspectives will develop a collective understanding of multiple problems. AI-enabled technologies will provide a conducive approach and make an organizational process more sustainable. Khan *et al.* (2019) discussed job design, information

Major talk of the theme	Future research questions (FRQ)
How can subset techniques of AI influence the work environment within the firm?	<p><i>FRQ8:</i> How can we use AI techniques to identify and evaluate the finest employees?</p> <p><i>FRQ9:</i> What role might AI techniques play in assessing how well new tools for improving workplace efficiency perform?</p> <p><i>FRQ10:</i> To what extent can the application of AI to the study of post-COVID-19 ramifications shed light on the urgent need to implement sustainable methods in human resource management and retention?</p> <p><i>FRQ11:</i> How can we create an AI-based model to address human resources problems like high turnover and inadequate knowledge mapping and connect these problems to legitimate progress?</p> <p><i>FRQ12:</i> What role might AI play in improving worker pay and benefits programmes?</p> <p><i>FRQ13:</i> What role might AI play in pinpointing the causes of employee complaints?</p> <p><i>FRQ14:</i> What role might AI approaches play in the development of intelligent virtual learning assistants for human resources departments?</p> <p><i>FRQ15:</i> How can suitable people be found for the company via the use of AI or its spinoff techniques?</p>

**Table 6.**  
Future research questions drawn from cluster 2 for future research studies

**Source(s):** Created by authors

Major talk of the theme	Future research questions (FRQ)
What is the role of disruptive technologies in human resources?	<p><i>FRQ16:</i> How can HRR problems in the post-COVID era be resolved?</p> <p><i>FRQ17:</i> What methods of human resource management based on disruptive technologies should be developed?</p> <p><i>FRQ18:</i> How can we use the efficacy of AI to plan not only for the immediate future in terms of human resource management but also for the long term when we need to heal and rebuild our strength after a pandemic has struck?</p> <p><i>FRQ19:</i> As there is so little research on the topic of HRR, how can we best plan for the future by including the role of AI and other technologies like Machine learning, IoT, and big data?</p> <p><i>FRQ20:</i> What are the benefits and drawbacks of using disruptive technology to automate human resource processes?</p> <p><i>FRQ21:</i> In what ways is disruptive technology affecting and changing human resource management through Human Resource Information Systems (HRIS)?</p>

**Table 7.**  
Future research questions drawn from cluster 3 for future research studies

**Source(s):** Created by authors

sharing, and flow within an organization. Employee benefits are the HR practices that deal with employee resilience, and AI supports the monitoring of progressive growth to understand HR practices and identify problems and risks, which will detect losses at an early stage for strategic decision making. [Minbaeva \(2021\)](#) revealed that shifting HR practices with AI-enabled techniques will lead to responding to disruptions and taking a forward-centric approach to new dimensions and trends. [Budhwar et al. \(2022\)](#) discussed that integrating AI techniques with HR practices can enhance resource utilization, mobilizing employees and

decision-making with corrective measures. Although the literature enumerates AI's benefits on resilience, many streams still require rigorous discussion and development of studies to deeply understand the techniques' scope. Hence, the stated discussion formulated some future research questions for the impending researchers (see Table 8), which will add value to the existing research studies with new directions and analyze the benefits of the application of disruptive technologies in the field of HRM.

*3.2.5 Neural networks and HRM.* Perez-Campdesuner *et al.* (2018) discussed how the use of neural networks enables organizations to analyze the internal variables that identify employee turnover and its relationship with human resources. Guohao *et al.* (2019) discussed that a neural network develops a conceptual model that analyses the relationship between employee competency and competency requirements. The use of bi-LSTM and convolution structure analyses the competency requirement. Wei and Jin (2021) discussed a model that focuses on analyzing a large amount of data and providing a conceptual model that can optimize the data and construct an efficient way to address problems. Yan *et al.* (2020) discussed that back propagation (BP) neural networks elaborate on understanding various challenges, such as risk inducement analysis, index system establishment, and network node selection of human resource management. It provides early warning to detect and develop a mechanism to handle the error. Liu *et al.* (2022) focused on understanding human resource benefits through the use of a self-organizing map (SOM) neural network model. Although the literature enumerates the benefits of neural network applications in human resource management, many streams still require rigorous discussion and the development of studies to deeply understand the scope of the techniques. Hence, the stated discussion formulated a few future research questions for impending researchers (see Table 9), which will add value to the existing research studies with new directions and analyze the benefits of the application of neural networks in the field of HRM.

*3.2.6 Risk management and AI.* Aziz and Dowling (2019) discussed and stated in their research that AI applications provide various solutions that address credit risk, market risk, and operational risk. Kraev and Tikhonov (2019) stated that there are many risk-provoking elements, such as leakage of confidential information, commercial loss, and loss of goodwill of an organization. Proper AI techniques can substantially provide mechanisms to develop strategies to mitigate risk and reduce risk threat realization. Popkova and Sergi (2020) discussed understanding the role of human intellect through the application of AI, which

Major talk of the theme	Future research questions (FRQ)
How is AI associated with resilience?	<p>FRQ22: How AI's ability to analyze, anticipate, and diagnosis might aid human resources departments in making sound choices?</p> <p>FRQ23: What steps must be taken to create an AI-enabled framework to lessen the impact of changes in HR procedures and strategic decision-making methods?</p> <p>FRQ24: What steps need to be taken to create models using AI methods like fuzzy logic, Bayesian networks, artificial neural networks (ANNs), etc., addressing issues like job design, job enrichment, and resource mobilization?</p> <p>FRQ25: How are HR practices evolving to meet the difficulties of today's global economy and compete in the global talent war?</p> <p>FRQ26: How to evaluate whether or not the system is making choices that positively or negatively influence resilience in accordance with organizational goals?</p> <p>FRQ27: How can AI help with mundane administrative chores like task allocation and staff management?</p>

Source(s): Created by authors

**Table 8.**  
Future research  
questions drawn from  
cluster 4 for future  
research studies

**Table 9.**  
Future research questions drawn from cluster 5 for future research studies

Major talk of the theme	Future research questions (FRQ)
What is the role of neural networks in HRM?	<p><i>FRQ28:</i> What conditions must exist before neural networks may be used in human resources?</p> <p><i>FRQ29:</i> How can neural networks aid in HRM's ability to assist businesses in growing and thriving long-term?</p> <p><i>FRQ30:</i> What role may neural networks play in ensuring that people and places are consistent by monitoring if the state must be continually altered and maintained via accurate prediction?</p> <p><i>FRQ31:</i> How can neural networks be used to develop a framework that can handle several tactics and operations to reduce staff turnover and gauge employee ability?</p> <p><i>FRQ32:</i> How can we use neural network processes to build a strong and resilient workforce?</p> <p><i>FRQ33:</i> What are the drivers and barriers of neural network mechanisms for creating a sustainable and resilient human resource?</p>

**Source(s):** Created by authors

would enable us to understand the influence of significant assessment of risk and monitoring continuous progress. [Chen et al. \(2021\)](#) analyzed the implications through various algorithms and focused on analyzing the risk through training programs. [Ore and Sposato \(2022\)](#) stated that the effective adoption of AI mitigates the risk associated with recruitment and selection practices. It improves the strategies to handle the automation process and provides ways to handle the changes in a better way. Although the literature enumerates the benefits of risk management through AI application, many streams still require rigorous discussion and development of studies to deeply understand the techniques' scope. Hence, the stated discussion formulated research questions for the impending researchers (see [Table 10](#)),

**Table 10.**  
Future research questions drawn from cluster 6 for future research studies

Major talk of the theme	Future research questions (FRQ)
How could AI play an important role in risk-oriented decision-making?	<p><i>FRQ34:</i> To what extent can organizations use cognitive analytics to swiftly access unstructured data, tailor offerings to individual customers, and lessen the role of bias in decision-making?</p> <p><i>FRQ35:</i> To effectively manage HR functions, how can one develop a model that accounts for variables like market risk and operational risk?</p> <p><i>FRQ36:</i> To what extent can we identify drivers and constraints to the use of AI approaches in the development of human resource practices that are sustainable?</p> <p><i>FRQ37:</i> How can AI be used to sift through mountains of data to find the insights that will help you make more informed business decisions about things like cybersecurity?</p> <p><i>FRQ38:</i> How can businesses use AI to serve as the missing ingredient in their risk management strategy?</p> <p><i>FRQ39:</i> How the use of AI may help businesses switch from a reactive to a proactive approach to risk detection by highlighting ambiguous language, flagging impending expiry dates, uncovering gaps in coverage, and determining the extent of any contractual standard deviations?</p> <p><i>FRQ40:</i> How might AI assist in the identification and resolution of company data breaches?</p>

**Source(s):** Created by authors

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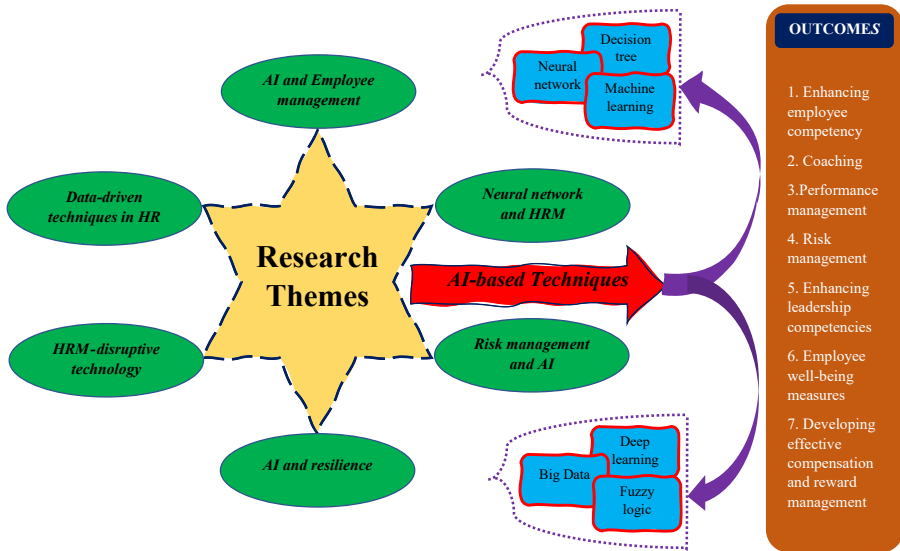
which will add value to the existing research studies with new directions and analyze the benefits of AI and risk management applications.

#### 4. Discussion and implications

The present research focused on analyzing the impact of artificial intelligence techniques in developing resilient human resources. The study adopted a systematic literature review and visualization approach to understand the present research state of conditions on HRR and AI. This current study analyzed the extracted CSV files to develop a research framework by developing graphs from the processed data, which will help us to understand the contributions in terms of the year, journal, author, countries, and institutions. The generated network maps discussed measuring the network relationship based on author-coauthorship and countrywise analysis as well as developing the word cloud map to identify the keyword occurrence. Using the extracted word cloud map, six emerging research streams were extracted as data-driven techniques in HR models: AI and employee management, human resource management and disruptive technology, AI and resilience, neural networks and HRM, and risk management and AI. Thus, the existing research substantially presents studies on the application of AI in HRR. [Bouaziz and Smaoui Hachicha \(2018\)](#) found that strategic human resource practices enhance the robustness of organizations. It encourages enhanced agility and integrity to deal with resilience and focus on developing HR practices. [Azadeh et al. \(2018\)](#) discussed that cognitive dimensions and employee contribution are the two major factors that account for developing resilient human resource management (RHRM).

The study developed an integrated algorithm to understand the implications and optimize RHRM. [Liu et al. \(2019\)](#) discussed well-being and HRM as positively associated with resilience. However, changing organizational conditions can focus on developing strong organizational understanding among people to deal with varied setbacks. The study by [Mitsakis \(2020\)](#) discussed that human resource development (HRD) mainly develops organizations to respond to unforeseen events, which mainly has a close relationship with individual and organizational resilience; thus, HRD practices make a substantial contribution to organizations' success. [Dirani et al. \(2020\)](#) explored the essential role of leadership competencies and the HRD environment during COVID-19. They analyzed how leadership competencies can enable the development of a sound work culture during the time of crisis and reflection on the new role of HR practices in handling changing conditions. [Merdiaty et al. \(2021\)](#) stated that it is equally important to make employees ready to accept changes and adapt to the changing environment, and mental well-being is one of the prime factors that motivate them to accept change. The right process and right practices can yield productive results for organizations as well as employees. [Vahdat \(2022\)](#) discussed that pioneering HR leaders are a major source for developing strategies to deal with crises and developing outwards strategies that can provide new solutions to handle employee forces.

Thus, based on the stated discussion, the present research proposed a future research framework in [Figure 4](#). The developed research framework comprises six emerging research themes of HRR in the initial stage. The identified research streams can be a yardstick for future research. The developed framework identified the major areas where organizations should provide the required attention to develop strategies and plans to cope with the market and business-changing conditions. AI-based techniques (neural networks, machine learning, big data, deep learning) enhance the benefits of handling complex situations and coping with changes within an organizational setting ([Guenole and Feinzig, 2018](#); [Charlwood and Guenole, 2022](#); [Bohmer and Schinnenburg, 2023](#)). It signifies that understanding the benefits and implications of AI techniques can enhance the rate of skilled workforce and develop employee skills towards coping with changes in a smoother and faster manner with a result-oriented approach.



**Figure 4.**  
Future research  
framework

**Source(s):** Created by authors

The next stage discussed several AI-based techniques that can be applied to enhance the efficiency and effectiveness of HR practices and achieve resiliency in the field. Finally, the third stage discusses the outcome/results of the application of AI techniques to human resource resilience. The outlined outcome/results enable organizations to develop HR practices with a structured approach, understand the role of the department in post-COVID conditions and measure strategic decisions to handle situations.

#### 4.1 Comparison of pre- and post-COVID literature trends

The comparative analysis of studies on AI in HRR in pre- and post-COVID scenarios identifies a very comprehensive approach. This signifies that AI expanded its wing in the field of HR before the pandemic, and organizations started mobilizing the benefits in numerous ways, such as candidate screening, efficiency in the recruitment process, employee engagement, and career development strategies (Garg *et al.*, 2018; Jai *et al.*, 2018; Upadhyay and Khandelwal, 2018). Taking into account the studies in the post-COVID scenario, it was identified that AI has also proven to be beneficial for handling crises and challenges in post-COVID scenarios and mobilizing the functionality and practices of an organization, such as concentrating on various opportunities and benefits, such as job replacement, decision making, and learning opportunities (Qamar *et al.*, 2021; Vrontis *et al.*, 2022). Hence, the literature and current research contribution signify the growing importance of AI in HR specifically handling resilience and bringing back the organization to its original position. Handling difficulties can mitigate the risk and develop corrective measures for the progressive growth of an organization.

#### 4.2 Theoretical implications

From a theoretical standpoint, the research study enumerates the understanding of the existing contribution of AI in the field of human resource resilience. Furthermore, we set forth some areas of knowledge that enable the improvement of organizational practices that focus

on developing the capacities and capabilities of employees to build a hybrid workforce that can handle various challenges and changing circumstances (Lu *et al.*, 2023). Considering the changing context, our research study has developed the anticipated benefits of AI in handling human resource resilience processes and practices. First, the present research state of condition has indicated the importance of AI in handling human resource crises and overcoming various challenges confronted with changes in business conditions (Malik *et al.*, 2023; Makarius *et al.*, 2020), which has emerged as a new research theme in the literature. Second, the study found that developing suitable conditions, methods, and resources in the organization can be a yardstick to harness employee potential and make them aware of the changes in the market that pave the way forward for AI adoption and implementation within business processes. Creating an innovative and supportive work culture can enhance the motivation level to work for changes and innovation, vigorously adapting and evolving through a supportive and sharing culture within organizations (Lei *et al.*, 2021). Therefore, AI postulates various strategic models and methodologies to improve the processes and practices within an organization. Third, our study explains different areas, i.e. through cluster analysis, to understand how AI identifies risks, formulates various HR models, and develops employee engagement practices that will facilitate building beliefs among managers and turn these outcomes into eloquent and actionable insights (Gulliford and Dixon, 2019).

Finally, our research study developed a future research framework that enables a path to understand the capability of artificial intelligence acting as a driver to understand the challenges and formulate way ahead plans and policies to match situational requirements. In understanding and developing the framework, the researchers followed the calls and directions in the extant literature to examine the development of AI and its implications in HRM (Malik *et al.*, 2020; Vrontis *et al.*, 2022). AI has expanded its existence in various HR practices, such as recruitment and selection, performance management, reward management, employee engagement, and employee existence. The developed framework objectively aims to provide a comprehensive understanding of the implications of AI integration with human resource resilience conditions and develop necessary strategies to have a meaningful design of solutions to deal with business problems. Hence, the findings of the study may be regarded as a result that addresses the benefits of artificial intelligence applications to deal with challenges and critical situations and act as a major contributor to the academic literature.

#### *4.3 Practical implications*

The present research has several practical implications for managers, policymakers, and organizations. First, the identified clusters in this article can be a major set by managers and HR experts to assess the readiness of organizations to adopt and implement AI technologies. It will focus on providing the required pathway to enhance the technical and nontechnical skills of employees. The research paper found that managers need to develop appropriate strategies, mechanisms for transparent communication, and interferences that will foster proper pathways, mutual understanding, association, and support between departments, project teams, and personnel (Mikalef and Gupta, 2021). This will facilitate the sound mobilization of AI within organizations and HRM processes. Second (Gambhir *et al.*, 2022), clearly indicate that adopting AI can lead to developing innovative practices for better understanding through using the available resources and enhancing existing capabilities. In this context, our research article shows that properly identifying risks and challenges can prevent negative outcomes and increase the scope for embarking on changes. Third, considering the smooth adoption of AI can establish transparent and clear communication strategies, and dialogues with employees can make it clear to understand the identified risks in time and deal with the problems with required solutions. The study outlined a better understanding of the AI adoption context and enhanced trust and confidence in management



initiatives and strategies (Mahidhar and Davenport, 2018). This will help managers, policymakers, and organizations operationalize their organizational business process, transformation strategies, contextual design directives, and investment in financial aspects. Finally, in this context, HR managers and policy makers should take into account various outcomes, such as (1) employee competency enhancement, (2) coaching, (3) performance management, (4) enhancing leadership competencies, (5) employee well-being measures, (6) risk management, and (7) developing effective compensation and reward systems. Thus, the present study allows us to create an understanding of the application of technology to human resource resilience. Moreover, it states that managers, policymakers, and government should take the best advantage of it for formulating policies and decisions and facing changing business conditions and embarking on competitiveness.

## 5. Conclusion

The emergence of the COVID-19 pandemic has developed severe uncertainties in the management of human resources. The emergence of the pandemic has disrupted many human resource processes. Considering the change in time and need, researchers and academic practitioners have shifted their attention to developing research studies (Saravi *et al.*, 2019; Carbonaro *et al.*, 2022) to understand the relevance of more sustainable and resilient human resource management. To adhere to this, artificial intelligence-based tools and technological development are major strengths to implement in different human resource operations. The research focuses on works conducted in the field of AI in HRR. Moreover, Dubey *et al.* (2022) discussed the dynamic capability of AI to mitigate and understand the risk prior to occurrence and provide solutions to decision-makers to minimize the loss and set forth optimal strategies. The research work analyzed the existing state of knowledge in terms of analyzing the Scopus extracted data and analyzed it through developing graphs to have a better understanding of the year trend, countrywise, authorwise, and institutionwise. It also analyzed and developed network maps and word cloud maps. The cluster of keywords resulted in the identification of six emerging research themes: data-driven techniques in HR models, AI and employee management, human resource management and disruptive technology, AI and resilience, neural networks and HRM, and risk management and AI.

The research study identified the benefits, implications, and applications through a comprehensive review and provided a deeper understanding to identify the current state of research and the benefits of the application of AI in human resource resilience. Reviewing the literature paved the way to develop the research streams. The study is confined to only journal articles and excludes other categories of research studies, such as conference papers, company reports, and book chapters. The visualization of data elucidates an understanding of the growth pattern and the amount of previous literature available on AI in HRR. Consequently, researchers recommend that impending researchers analyze the implication of AI and mitigating barriers in human resource resilience. It is also recommended to develop future studies based on a mixed approach, i.e. a qualitative and quantitative approach using techniques such as the Analytic Hierarchy Process, Decision-Making Trial and Evaluation Laboratory, and Interpretative Structural Modeling to understand the implications in a broader way.

## 6. Limitation

The present research study has certain limitations, which can be effectively addressed in the future. First, the present research work is confined to the extraction of articles from one database, i.e. SCOPUS. The researchers signify a clear understanding that articles published in other databases and from Google Scholar can predominantly enlarge the scope of knowledge synthesis to make it rigorous. Second, restrictions on particular keywords and

Boolean operators may not have identified articles relevant to the research topic due to issues related to database unavailability or human error. In this context, we believe that including databases publishing interdisciplinary research literature can facilitate a comprehensive review of the literature on the theme of AI application in human resource management. Finally, the present study is based on qualitative aspects or basically relied on literature to develop the work and identify the research themes, further validate the trending themes and determine the importance of research propositions. Future studies can be determined through interviews or Delphi studies, and then the quantitative data can be analyzed using DEMATEL, AHP, and FUZZY AHP. Such an initiative will bridge the gap between academic findings and the perception of HR practitioners to develop a research agenda aligned to the needs of both industry and society.

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