



# Visual Analysis of Human Resource Management Research Under the Background of Big Data

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**Abstract.** With the rapid development of digital economy, the application of new generation information technology such as big data has gradually transformed enterprise human resource management, forming human resource management under the background of big data. In order to explore its research status and development trend, this paper takes 143 relevant documents collected in the web of Science Database in recent ten years as the research object, makes quantitative analysis of relevant documents in this field by using CiteSpace software, and constructs relevant knowledge map. The results show that documents produced by USA are the largest, followed by England, and India, Spain, Italy, Germany and China have some influence; the documents are mainly published in journals in the field of management; the documents content involve performance, management, impact, artistic intelligence, etc.; in recent years, there are more and more related documents, and they involve other fields, which may show the trend of cross domain development.

**Keywords:** Big Data · Human Resource Management · Citespace · Knowledge Graph

## 1 Introduction

With the rapid development of digital economy, new generation information technologies such as Internet, cloud computing, blockchain and big data have become new drivers of high-quality economic and social development. More and more enterprises use these new technologies to promote their development. The new generation of information technology has changed the external market environment and internal organizational structure and boundary faced by enterprises [7]. Especially the emergence of big data, changed the mode of human resource management in the organization, made it fundamentally changed. Big data refers to data sets that exceed the acquisition, storage, management and analysis capabilities of traditional database management software [4]. In recent years, human resource management has gradually transformed under the background of big data, and a human resource management model combined with big data

has emerged, which has brought unprecedented challenges to the research and practice of human resource management.

From a historical perspective, the evolution of the combination of technology and human resource management can be roughly divided into four stages. In the early stage of human resource management, human resource managers used human resource management information system to implement planning, management, decision-making and control activities [1], in order to reduce the employment cost of enterprises. Electronic human resource management, which appeared in the 1990s, is the planning, implementation and application of information technology in the practice of human resource management [8], which can not only improve the work participation of employees in the human resources department, but also affect their work behavior mode [6]. By the early 21st century, enterprises have formed virtual human resource management through the application of network technology. The management model is a new network-based human resources framework based on partnership and information technology to help organizations acquire, develop and utilize intellectual capital [3]. With the advent of the digital age, emerging information technologies such as big data have been widely used, and big data human resource management has emerged. Its essence is to use big data technology to drive human resources in the organization, reshape employee experience, and stimulate the organization to create value.

The emergence of big data technology has changed the internal and external environment of enterprises, played an important role in the survival and development of enterprises, and human resources are the basis for the survival and development of enterprises. Therefore, the research on human resource management under the background of big data is of great significance. And relevant scholars have studied it. For example, Xi Nan and others have found that big data human resource management has made qualitative changes on the basis of information-based human resource management, and big data human resource management can bring competitive advantages to the organization [5]. Verma et al. proposed the definition of Big Data HRM and studied its impact on the improvement of human resource service quality and innovation ability of small and medium-sized enterprises [9].

Different from the above research, by econometric analysis of the existing relevant literature, especially the foreign literature on human resource management under the background of big data, we can understand the latest trends of human resource management research and practice. Based on this, with the help of CiteSpace software, this paper analyzes the literature related to human resource management under the background of big data in web of Science (WOS) database in recent ten years, in order to provide reference for the research and practice of human resource management in China.

## **2 Research Method**

### **2.1 Aata Source**

This paper takes the Web of Science (WOS) database as the source of literature statistics. Similar concepts to “big data human resource management” include “HR Analytics” and “HRM digitization”. Therefore, the subject words are searched with “big data human resource management” or “HR Analytics” or “HRM digitization”. The search time span

is from January 1, 2012 to December 31, 2021. After screening out irrelevant literature, 143 relevant literature are finally obtained. Download abstracts, authors, keywords, references and other information as required data.

## 2.2 Research Tools and Methods

The CiteSpace software used in this paper was invented by Professor Chen Chaomei and is widely used to map scientific knowledge. The concept of scientific knowledge map originates from a seminar organized by the National Academy of Sciences in 2003. With the development of information visualization, various tools for drawing scientific knowledge map are also coming [10]. CiteSpace software has become one of the most popular map drawing tools because its map has distinctive characteristics. It is most common for scholars to use CiteSpace and its knowledge map for literature review. Among them, Jianhua Hou and Zhigang Hu were the earlier scholars to apply CiteSpace in China. They analyzed the discipline distribution and use function of papers applying CiteSpace software in WOS and CNKI [2].

In this paper, CiteSpace software is used to analyze the distribution of issuing regions and institutions of the above-mentioned documents, then analyze the co citation of journals, finally analyze the co-occurrence of keywords and the evolution path of topics respectively, and finally summarize the current research situation and future development trend of this field.

## 3 Data Analysis

### 3.1 Distribution of Issuing Regions and Institutions

Use CiteSpace to visually analyze the relevant literature published in various regions and countries, select time slicing from January 2012 to December 2021, set the time interval to 1 year, select “institution” and “country” in the “note types” panel, and set the threshold value as the default value. After running CiteSpace, the knowledge map of human resource management research areas and institutions under the background of big data is obtained (See Fig. 1).

In Fig. 1, the circular node represents a research institution or country. The larger the node, the more documents representing the output of the institution or country. The statistical results show that the circular node representing USA is the largest, indicating that the literature produced by USA is the largest, followed by England, and India, Spain, Italy, Germany and China have some influence. Research institutions mainly include Univ Southern California, Montpellier business Sch, aatto Univ, etc. From the overall data, China has some research in this field, but it is still in a backward stage compared with the first ranked United States. In the future, China should invest more resources in this field.

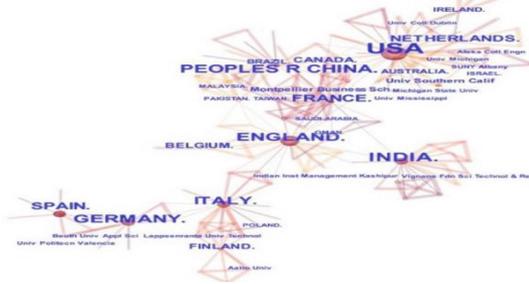


Fig. 1. Distribution of issuing regions and institutions map



Fig. 2. Journal co citation map

### 3.2 Journal Co Citation

In this paper, cited journal is selected as the network node to obtain the *co citation* knowledge map of human resource management research journals under the background of big data, as shown in Fig. 2. Based on the statistics of 143 literatures, Table 1 lists the journals and centrality cited more than 30 times.

As shown in Fig. 2, the circular node with purple outer ring is the turning point and has high centrality. It can be seen that MIS QUART, ACAD MANAGE REV and HARVARD BUS REV have high volume and centrality. By consulting the above journals and their fields, it is found that the research on human resource management under the background of big data is mainly concentrated in the field of management.

### 3.3 Keywords Co-occurrence Analysis

Keywords are a high generalization of the subject content of the literature. The analysis of keywords can understand the hot spots in this research field. CiteSpace software is used for keyword analysis to obtain the keyword co-occurrence knowledge map in the field of human resources management under the background of big data (See Fig. 3), and then sort out the list of keywords cited more than 10 times (See Table 2).

Figure 3 and Table 2 show that in addition to big data, human resource management and HR analytics, which are searched by keywords, performance, management, impact and artistic intelligence are also cited frequently.

**Table 1.** Journals with Frequency more than 30 Times

Count	Centrality	Cited Journals
61	0.06	INT J HUM RESOUR MAN
56	0.04	ACAD MANAGE J
52	0.1	HARVARD BUS REV
50	0.06	HUM RESOUR MANAG J
49	0.02	J MANAGE
47	0.13	ACAD MANAGE REV
47	0.05	HUM RESOUR MANAGE R
42	0.19	MIS QUART
41	0.07	J APPL PSYCHOL
40	0.05	HUM RESOUR MANAGE-US
36	0.08	INT J INFORM MANAGE
33	0.03	J BUS RES
32	0.07	MANAGE SCI
30	0.03	STRATEGIC MANAGE J

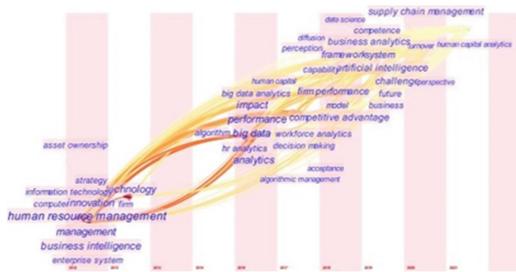
**Fig. 3.** Keywords co-occurrence map

### 3.4 Theme Evolution Path Analysis

CiteSpace software is used to analyze keywords and make the thematic evolution knowledge map of human resource management research under the background of big data (see Fig. 4). From the Theme Evolution chart, it can be seen intuitively that in 2012, scholars have applied information technology to the field of human resources for data analysis, but there are relatively few studies, mainly using a large amount of data for research on enterprise performance, innovation, strategy and so on. There was no relevant literature in 2014. In 2016, the concept of “big data” began to appear in the field of human resource management, which is closely related to the subsequent emergence of

**Table 2.** Keywords cited more than 10 times

Count	Centrality	Keywords
41	0.25	Big data
29	0.28	Human resource management
23	0.16	Performance
21	0.11	Hr analytics
18	0.25	Management
18	0.13	Impact
13	0.12	Artificial intelligence
12	0.14	analytics
12	0.07	Firm performance
11	0.16	innovation
10	0.08	system
10	0.06	model



**Fig. 4.** Thematic evolution knowledge map

“firm performance, artistic intelligence, turnover, competence and human capital Analytics”, indicating that more and more studies have begun to use big data to analyze enterprise employees in recent years. Among them, words such as “artistic intelligence and supply chain management” appear, indicating that the research of human resource management in the context of big data involves other fields and may show a trend of cross field development.

## 4 Conclusion

Using CiteSpace software, this paper makes a visual analysis of 143 documents on human resource management under the background of big data in WOS database in recent ten years. The results show that: at present, the United States has the most research on big data human resource management, followed by England, and India, Spain, Italy, Germany, China and other countries have a certain influence in this field; relevant research results

at home and abroad are mainly published in management journals; The contents with high research frequency in this field involve performance, management, impact, artistic intelligence, etc.; in recent years, words in other fields such as “artistic intelligence and supply chain management” have appeared in research, indicating that big data human resource management may show cross domain development in the future.

However, there are only 143 relevant literatures searched in this paper in recent ten years, indicating that domestic and foreign scholars’ research in the field of big data human resource management is not sufficient, and research in this field should be increased in the future. In addition, the analysis of journal co citation map of human resource management research under the background of big data shows that relevant research is basically published in management journals and rarely combined with other fields. However, the thematic evolution knowledge map shows that relevant research has been involved in the field of artificial intelligence in recent years, and is now in the era of rapid development of digital economy, the application and research of big data, artificial intelligence, blockchain and other technologies are becoming more and more extensive. Therefore, in the future, in addition to big data, domestic and foreign scholars can also study the application of other advanced technologies in the field of human resource management.

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