# The Hotspot and Evolution of Gig Economy Research Based on Visualization Analysis of WOS Core Database

Xiaochen Lin[1, a], Wei Ren[1, b]
[a]e-mail: m17863113986@163.com, [b]e-mail: rwshan@126.com

[1]School of Business Administration, Guangdong University of Finance and Economics, Guangzhou, China

**Abstract**—Gig economy, as a new economic emerging in recent years, has been widely concerned by domestic and foreign scholars. The gig economy involves changes in many fields, including platform management, company management, and labor law. In the era of big data, the research and analysis of existing literature to reveal the research of domestic and international scholars on the gig economy to identify the problems and future research trends in the field of gig economy is the key issue that researchers need to focus on. This study uses 355 articles on the theme of "gig economy" included in the WOS core database from 2010 to 2021 as the research object. Based on Citespace，it draws a map of the collaboration between authors and organizations, and analyses the hot spots and developing trends in this field. This article finally got the academic cooperation circle with Univ Oxford as the core, and the three stages of gig economy development, and the future research hotspots are mainly in "sharing economy", "digital labor" and "platform". This paper provides the direction and foundation for the future study of the gig economy.

**Keywords**-gig economy; visualization; knowledge graph; Citespace

## 1 Introduction

Gig economy, as a new type of employment, is the result of the fast development of sharing economy in the new period, which has aroused the concern of domestic and foreign scholars. The typical representative platform-based flexible employment in the gig economy came into being, combining offline demand with online technology, greatly alleviating the imbalance between the supply and demand of human resources. The characteristics of platform-based flexible employment are: flexible work and blurred labor relations. The problems in the flexible application of HRM are: the whole of flexible staff is low, the gender inequality is not fair, the relationship is ambiguous, and there is no third party supervision. [1]. The current problems and other areas involved in the gig economy, such as management, labor relations, and labor law, have had new impacts, and scholars have also conducted research on this. China's gig economy is in a period of rapid development, and it is also facing many urgent problems that need to be resolved. On this basis, combined with Citespace and other visualisation research tools and instruments, it summarises and analyses the current research hotspots, research trends and their trajectories in the research process of the gig economy, providing new ideas and foundations for the research of the gig economy.

MSIEID 2022, December 09-11, Chongqing, People's Republic of China
Copyright © 2023 EAI
DOI 10.4108/eai.9-12-2022.2327724

## 2 Visual analysis of gig economy

### 2.1 Data Sources

In this paper, 477 papers were compiled from the WOS core database for the period 2010 to 2021, using the term "gig economy" as the subject search term. The keywords and abstracts were filtered to 355 papers. The download date is 27 November 2021. After deletion and selection, information such as titles and authors and keyword year institutions were exported to form the research material for this study.

### 2.2 Methods

This paper is based on bibliometric and information visualisation. Using visualisation and analysis software such as Citespace, word frequency analysis, co-occurrence analysis and cluster analysis are used to analyse and derive key information such as authors, institutions and keywords of the literature, and finally construct the corresponding knowledge graph. Research team collaboration maps can reveal the interconnections between scholars, countries and institutions in different subject areas, and are an important indicator of the academic impact of researchers, countries and institutions. Common vocabulary maps (characteristic terms or keywords) help users to analyse research hotspots and evolutionary trends, while cluster views effectively represent the structural features between clusters and highlight key nodes and key relationships.

Citespace is a JAVA based tool developed by Professor Mei-Chao Chen in the USA to measure and analyse research papers in a particular field to obtain relevant research hotspots and trends [2].

### 2.3 Annual distribution of the number of documents

The annual distribution of the number of papers in the field of gig economy in the WOS core database is shown in Figure 1. Papers in the zero-work economy start in 2016 and are mainly concentrated in 2016-2021, with a maximum number of 120 papers published in 2020.

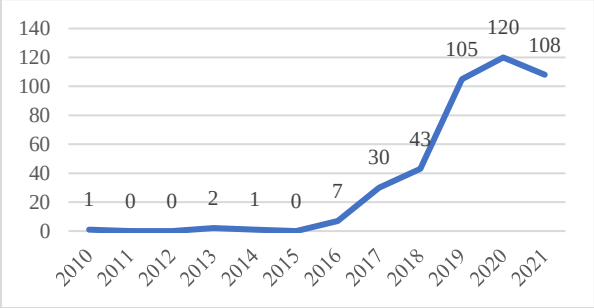


**Fig.1.** Annual distribution of the number of literatures

### 2.4 Author cooperation map

According to the PRICE rule, the concentration of authors in the field is higher when the number of papers published exceeds 50%, calculated by (1)[3].

$$M = 0.749\sqrt{N} \quad (1)$$

NS: M is the minimum number of posts required by the core author, and N represents the number of posts by the highest author in the field.

The analysis of Citespace vocabulary frequencies yielded a maximum of 10 publications for a single paper, and M=2.35 was calculated. In accordance with the approximate simplification method, there were at least three major papers in this study. Sixteen were counted. Table 1 shows the top 10 postings. The 355 postings, or 85.13% of the total number of papers, exceeded the required 50%, indicating that there is a concentration of authors of papers in the gig economy.

In the author's co-occurrence map drawn by Citespace software, the size of the node indicates the amount of articles published by the author, the connection between the nodes indicates the cooperation relationship between the authors, and the thickness of the connection indicates the strength of the author's cooperation. It can be seen from Table 1 and Figure 2 that VILI LEHDONVIRTA (10) and MARK GRAHAM (9) are in the top two positions, among which ISIS HJORTH (4), ALEX VEEN (4), ALEX J WOOD (4), CALEB GOODS (4) , TOM BARRATT (4) tied for third place. Although there is a wide variation in the number of publications, the criteria for core authors in the field show that all seven of these authors are well established researchers in the field and have established their own teams. VILI LEHDONVIRTA and MARK GRAHAM have the closest collaborative relationship.

**Table 1** Authors With More Than 10 Posts

| **Author** | **Relevant information** | |
|---|---|---|
| | ***Number*** | ***Frequency*** |
| VILI LEHDONVIRTA | 1 | 10 |
| MARK GRAHAM | 2 | 9 |
| ALEX J WOOD | 3 | 4 |
| ALEX VEEN | 4 | 4 |
| ISIS HJORTH | 5 | 4 |
| CALEB GOODS | 6 | 4 |
| TOM BARRATT | 7 | 4 |
| JIANNAN LI | 8 | 3 |
| BOCONG YUAN | 9 | 3 |
| NATHANIEL MING CURRAN | 10 | 3 |

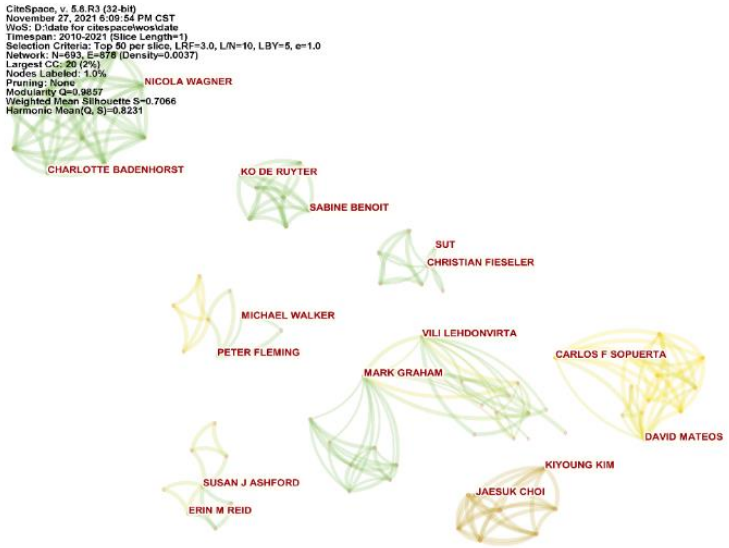


**Fig.2.** Author cooperation network map

### 2.5 Institutional cooperation map

The distribution of institutional collaboration is shown in Figure 3, and the number of papers published by 5 or more institutions is shown in Table 2. from Table 2 and Figure 3 we can see that there are 9 institutions with 5 or more papers, and their volume is 86 papers, accounting for 24.2% of the total number of papers published. Overall, research on the zero-work economy has been concentrated at the university level, with two small, US-focused and two UK-focused regions in Oxford and Melbourne respectively. The University of Oxford is at the centre of the gig economy and it has played a pivotal role in the academic development of the gig economy.

**Table 2** High Frequency Institution

| **Institution** | **Relevant information** | |
|---|---|---|
| | ***Number*** | ***Frequency*** |
| Univ Oxford | 1 | 21 |
| Univ Melbourne | 2 | 10 |
| Univ Sydney | 3 | 10 |
| Univ Technol Sydney | 4 | 9 |
| Univ Michigan | 5 | 8 |
| McMaster Univ | 6 | 7 |
| Univ Toronto | 7 | 6 |
| Univ Minnesota | 8 | 5 |
| Univ Bristol | 9 | 5 |
| Royal Holloway Univ London | 10 | 5 |

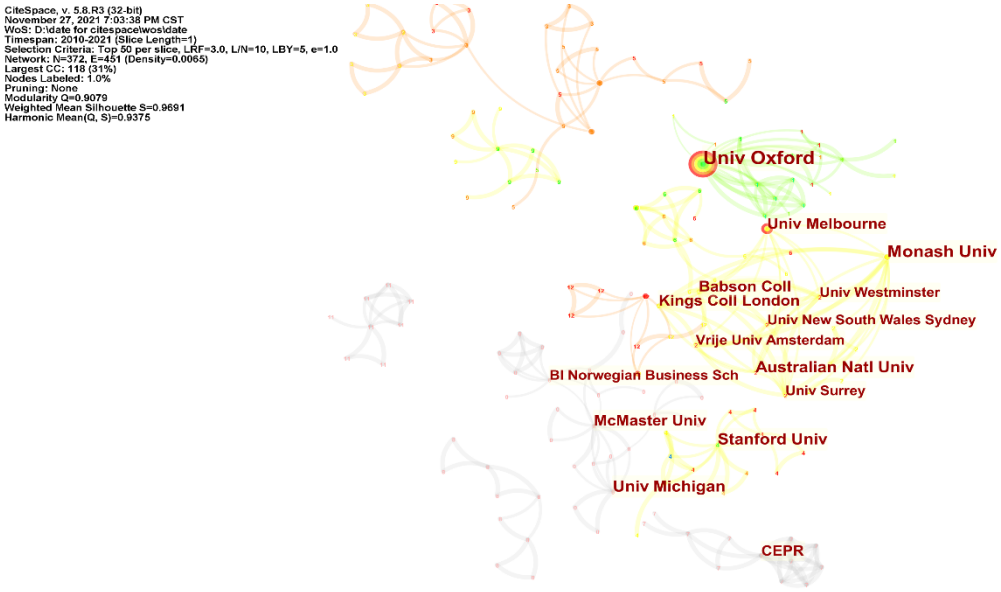


**Fig.3.** Institution cooperation network map

### 2.6 Co-citation analysis of journals

Journal co-citation refers to the simultaneous citation of two or more journals in a citing document, which usually reflects the relationship between journals and the distribution of knowledge bases. Combining with Table 3, it can be seen that only the 10 most cited journals are shown in the map. The most influential cited journals in this field are as follows. Most authoritative journals recognized at home and abroad are concentrated in the fields of human resources, strategic management, and organizational behavior, as shown in Figure 4.

**Table 3** Co-cited journals top10

| NUMBER | Citation Counts | References | Cluster ID |
|---|---|---|---|
| 1 | 120 | WORK EMPLOY SOC, 2017 | 3 |
| 2 | 77 | NEW TECH WORK EMPLOY, 2018 | 3 |
| 3 | 76 | COMP LABOR LAW POLIC, 2017 | 5 |
| 4 | 76 | HUM RELAT, 2017 | 3 |
| 5 | 65 | NEW MEDIA SOC, 2018 | 1 |
| 6 | 60 | ECON LABOUR RELAT RE, 2017 | 4 |
| 7 | 59 | AM SOCIOL REV, 2017 | 7 |
| 8 | 59 | TRANSFER-LONDON, 2019 | 7 |
| 9 | 58 | INT J COMMUN-US, 2018 | 1 |
| 10 | 51 | ACAD MANAGE REV, 2016 | 2 |

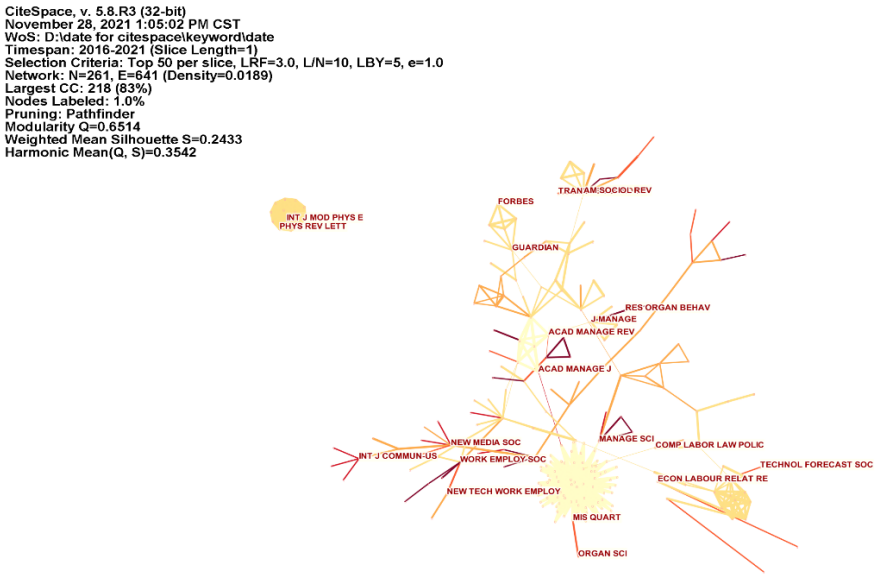


**Fig.4.** Co-cited journals network map

## 2.7 Keywords Co-occurrence and Clustering Analysis

### 2.7.1 Keywords Frequency Statistics

Calculate high-frequency keywords through Citespace, and then merge related keywords, such as "job satisfaction" and "organizational identification" merged into "work attitude", "digital technology" and "big data" merged into "Internet technology", "algorithmic control" and "surveillance" are merged into "digital control", and the top 10 high-frequency keywords are shown in Table 4. Among them, "gig economy" has the highest frequency with 164 times, followed by "labor" with 71 times, "gig work" (54), "platform economy" (37), and "job" (29). Through the high-frequency keywords in the past five years, we can discover the main research hotspots of the gig economy in recent years, such as "sharing economy", "digital platform", "digital labour", and "employment relationship".

**Table 4** Keyword Frequency Statistics

| **Key Words** | **Relevant information** | | |
|---|---|---|---|
| | ***Number*** | ***Frequency*** | ***Centrality*** |
| gig economy | 1 | 164 | 0.1 |
| labor | 2 | 71 | 0.01 |
| gig work | 3 | 54 | 0.01 |
| platform economy | 4 | 37 | 0.07 |
| job | 5 | 29 | 0.4 |
| sharing economy | 6 | 26 | 0.02 |
| information | 7 | 23 | 0.01 |

| | | | |
|---|---|---|---|
| management | 8 | 18 | 0.29 |
| employment | 9 | 18 | 0.21 |
| digital platform | 10 | 15 | 0.01 |

### 2.7.2 Keywords Co-occurrence Analysis

Visualize the high-frequency keywords through Citespace, and finally derive the keyword co-occurrence map, as shown in Figure 5. Among them, the node size reflects the frequency of keywords, and the number of connections indicates the degree of close connection with other research hotspots. It can be seen that "gig economy", "job", "management", and "digital labour" are several large nodes with high centrality, indicating that these keywords are the research hotspots in this field in the past five years.

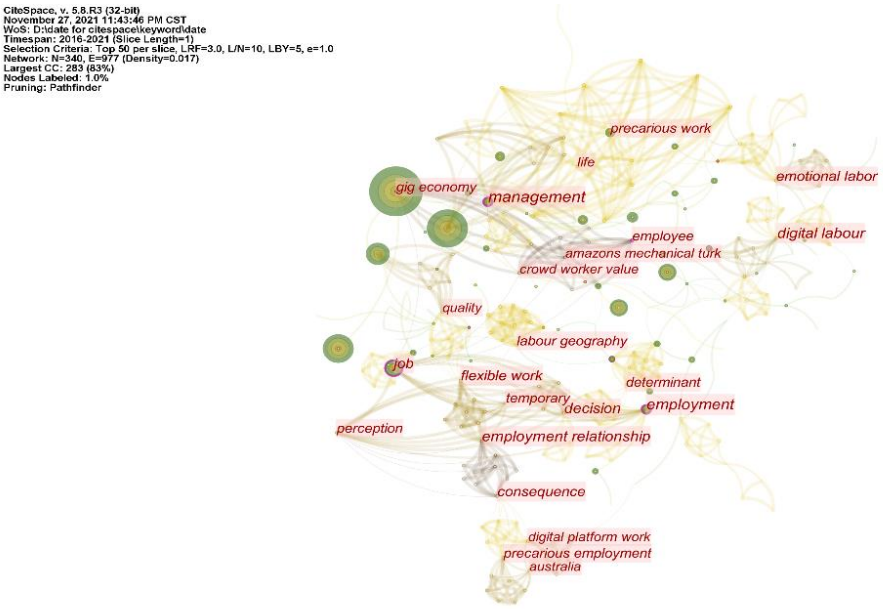


**Fig.5.** Keywords network cooccurrence map

### 2.7.3 Keywords Clustering Analysis

Depending on the network structure and the clarity of the clustering, Citespace provides two metrics, the module value (Q value) and the average profile value (S value). In general, clustering is considered reasonable when Q values are in the interval [0.1], Q > 0.3, S > 0.7 [2]. After comparison, the initial settings of Citespace yielded a mapping structure that was confusing and difficult to understand, so some adjustments were made to it in this step. Pathfinder and Pruning slicing networks were chosen, resulting in Q = 0.8551 (>0.3) and S = 0.8988 (>0.7).

The cluster analysis finally generates 13 cluster labels. As shown in Table 5 and Figure 6, the cluster labels include "algorithmic management", "digital labour", "precarity", "independent work", "sociology of work" and so on. By categorizing these cluster labels, it can be found that

the research in the gig economy field can be divided into three categories.

The first category is the management of digital platforms, including algorithm management, digital labor, and digital platforms. The main manifestation of the gig economy is the development of digital platforms. Supported by big data, digital platforms are developing quickly, and the market is bright. It offers a platform for many unemployed people. At the same time, the data algorithm of the platform and the remote control of laborers through the algorithm. However, if workers only use algorithms to control, without humanized management, the emotional impact on workers will be great. Therefore, how to balance algorithm management and humanized management in the gig economy is the main focus of future research.

The second category is the characteristics of the gig economy. The gig economy has greater flexibility, but at the same time instability. The gig economy lowers the threshold for many jobs, provides more flexible job options and higher total income, but also introduces fierce competition, so that they have to face extremely low hourly wages. Low-skilled workers have gained superficial flexibility by selling statutory employee guarantees. Due to the pressure of life and competition, they have to sacrifice this flexibility. They actively choose extended working hours and more intense self-exploitation, facing income constraints. Instability and full-time and unstable work schedules [4]. How to deal with the shortage of gig economy is also an important issue worth paying attention to.

The third category is legal issues and labor rights issues in the gig economy. The relationship between the platform and the workers is rather special. The gig economy platform usually requires workers to recognize themselves as independent contractors, thus refusing to guarantee workers' minimum wage, provide various insurances, and compensate workers for their labor materials. Because workers have a certain degree of dependence on the platform, and the platform has a certain degree of control over the workers, it is difficult for workers to leave the platform and cannot fight for more benefits for themselves [5]. Therefore, there are still many issues to be resolved regarding the legislative issues in the gig economy.

**Table 5** Clustering Information

| ID | Size | Year | Clustering Terms |
|---|---|---|---|
| 0 | 36 | 2019 | algorithmic management |
| 1 | 31 | 2018 | digital labour |
| 2 | 28 | 2017 | precarity |
| 3 | 27 | 2017 | independent work |
| 4 | 25 | 2017 | sociology of work |
| 5 | 24 | 2018 | contingent work |
| 6 | 21 | 2018 | social media |
| 7 | 19 | 2016 | contract work |
| 8 | 19 | 2017 | precarious employment |
| 9 | 17 | 2018 | digital platforms |
| 10 | 14 | 2018 | labour geography |
| 11 | 12 | 2018 | labour law |
| 12 | 10 | 2018 | information technology |

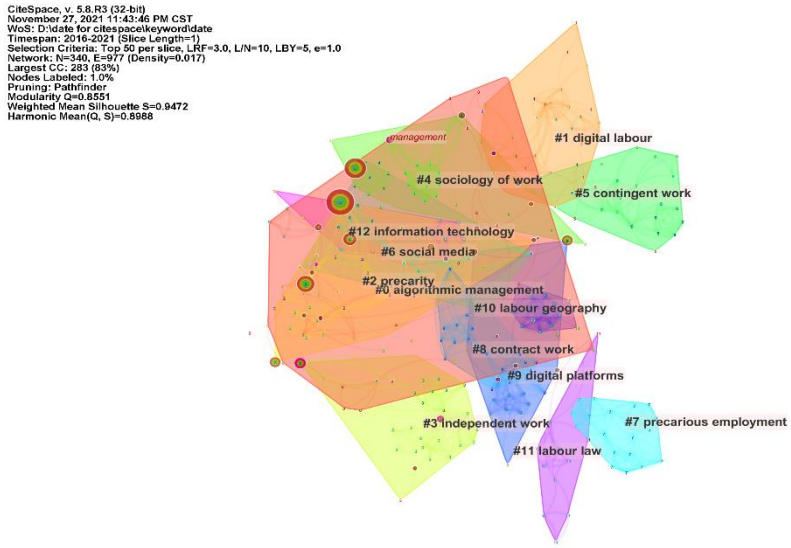


**Fig.6.** Keywords clustering map

## 3 Research trend analysis

Burst detection is currently one of the main tools for document content mining, and it can reflect active or cutting-edge research hotspots. There are 13 emergent words in the gig economy, as shown in Table 6. According to the time and type of emergent words, this research divides the research in the gig economy field into three stages: 2016-2017, 2018-2019, and 2020-2021.

The first stage is 2016-2017. "decision", "temporary" and digital work" had the greatest strength, indicating that the gig economy at this stage is mainly focused on temporary employment and digital work. The gig economy has just begun to develop in the same form as temporary employment.

The second stage is from 2018 to 2019. The strength of "temporary worker", "employment" and "organization" is relatively strong, indicating that in this stage, the gig economy has organizations to coordinate temporary workers. The employment difficulties have been eased to a certain extent.

The third stage is from 2020 to 2021. The strength of “digital labor”, “sharing economy”, “identity” and “big data” is relatively strong, indicating that in the second phase, due to the emergence of the epidemic and the development of big data technology, algorithms enhancement has given the platform stronger management tools. In the context of the sharing economy, the emergence of gig labor has alleviated part of the employment pressure, but at the same time, there has also been controversy over the definition of the identity of workers. Among them, there is more discussion about whether the platform needs to bear of the workers’ social insurance responsibilities.

Based on the above three stages of development, we can see that although the gig economy is a

new economic form that has emerged in recent years, it has become a new form of employment, which is important for the government, platforms, and workers. Greater impact. From the initial temporary employment to the current platform employment, the scale of development has become larger and larger, and at the same time the problems will increase. Scholars discussing the problems that arise under the gig economy also reflects that the academic circles' understanding of the gig economy is becoming more and more objective and comprehensive.

**Table 6** Burst Terms Information

| Key Words | Strength | Begin | End |
|---|---|---|---|
| decision | 1.2966 | 2017 | 2018 |
| temporary | 1.208 | 2017 | 2017 |
| digital work | 1.208 | 2017 | 2017 |
| challenge | 2.162 | 2019 | 2019 |
| temporary worker | 1.5185 | 2019 | 2019 |
| employment | 1.4828 | 2019 | 2019 |
| organization | 1.2164 | 2019 | 2019 |
| digital labor | 2.3537 | 2020 | 2021 |
| rise | 1.9532 | 2020 | 2021 |
| sharing economy | 1.8188 | 2020 | 2021 |
| labour proce | 1.6563 | 2020 | 2021 |
| identity | 1.2057 | 2020 | 2021 |
| big data | 1.1841 | 2020 | 2021 |

## 4 Conclusion

A combination of bibliometrics and knowledge mapping was used to visualise and analyse the 355 English papers in the WOS core data. In this paper, the authorship of scholars in the field of gig economy is studied :The research results are mainly focused on scholars such as VILI LEHDONVIRTA and MARK GRAHAM.Gig economy is dominated by universities, forming an academic collaboration circle with the University of Oxford as the core, and a smaller academic collaboration circle with the University of Melbourne as the core; Thirdly, this paper finds that the evolutionary research line of the gig economy can be divided into three stages: 2016-2017, 2018-2019 and 2020-2021, and gives information on the keyword mutations in each time period; Finally, the paper discusses the hotspots and trends of research on the gig economy, dividing it into three stages and three categories, and points out that the future research hotspots will focus on "sharing economy", "digital labour" and "platform The future research will focus on the "sharing economy", "digital labour" and "platforms". Future research needs to focus on the protection of workers' rights and interests in different countries, and provide valuable suggestions and opinions for scholars in this field.

## References


[1] Zhou Wencheng & Ni Gan. (2021). Research on the Issues and Countermeasures of the Platform-based Flexible Labor Resource Management under the Gig Economy. Operation and Management (09), 139-143.

[2] CHEN Y, et al.,. (2015). The methodological function of CiteSpace knowledge graph. Research in Science of Science (02), 242-253.

[3] QIU, J.P.,. (2000)Information Metrology (6) Lecture 6 Distribution of Authors of Documentary Information: Lotka's Law[J]. Information Studies:Theory, (06): p. 475-478.

[4] Shi Peipei & Liu Yushu. (2021). The rise of giant platforms and the research on ordinary workers' crisis response. Yunnan Social Sciences (06), 106-115+187.

[5] Xie Fusheng, Wu Yue & Wang Shengsheng. (2019). Political Economics Analysis of the Globalization of Platform Economy. Chinese Social Sciences (12), 62-81+200.