Using Baidu Index to Investigate the Spatiotemporal Characteristics of Knowledge Management in China

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Abstract. The relevance of the article explained by the fact that knowledge economy calls for knowledge management, and modern knowledge management is a new type of management that emerged in the days of the knowledge economy. The purpose of this paper is to investigate spatiotemporal characteristics of public attention towards knowledge management in China. The leading research methods were analysis, synthesis, comparison, deduction, and induction. This study uses Baidu index to analyse the spatiotemporal characteristics of the public's attention to knowledge management. It was noted that the trend of finding “knowledge management” for the last 11 years peaked at the end of 2016, and the decrease appeared around National Day each year. It was stated that the groups concerned about “knowledge management” are mainly distributed in Guangdong, Beijing, and Shanghai. The factors that affect the changes in the search volume of “knowledge management” include the traditional Chinese holidays, the Spring Festival, the National Day, and the release of knowledge management-related norms. In addition, the study found similar search trends for “knowledge management” and “knowledge management system”. It was concluded that the knowledge management systems are used only when the amount and complexity of knowledge accumulation within an organisation reaches a certain level.

Keywords: knowledge economy, management system, search engine, computational social science

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Introduction

In the era of knowledge economy, knowledge has become the guide to creating economic and social value [1; 2]. The research on knowledge management in Chinese academia began in 1998. In 2000, the Ministry of Management Science of the National Natural Science Foundation of China took “research on enterprise knowledge management issues” as an encouraged research field, marking that enterprise knowledge management has become a research hotspot in domestic academic circles [3]. Although the discussion of knowledge management has been ongoing for many years, its definition has not formed a unified understanding and definition. However, as M. Abu Ghazaleh & A.M. Zabadi stated, the academic world has never lacked the definition of knowledge management [4].

W.-Y. Chiang believes that knowledge management is a process wherein an organisation acquires knowledge and converts it into the resources needed by the enterprise through various information channels and receipts [5]. L. Agostini & A. Nosella believe that knowledge management refers to the process of creating, acquiring, and using knowledge to enhance the performance of an organisation [6]. D. Orso et al. believe that knowledge management involves four aspects through research: top-down monitoring; promotion of knowledge-related activities; creation and maintenance of knowledge infrastructure; renewal of the organisation and transformation of knowledge assets, using knowledge to enhance its value [7]. A.K. Varudharajulu and Y. Ma believe that knowledge management is to help people reflect on the knowledge they have, to help and develop the technology and internal structure of enterprises that supports people’s knowledge exchange, and to help people obtain access to knowledge sources and promote knowledge exchange between them [8]. Based on the idea that organisations are social groups and “knowledge systems” [9], the organisation of knowledge systems is widely considered to comprise four “knowledge processes”: creation (also known as construction); storing/indexation; transfer; application [10].

Today, the humanity is on the brink of the Fourth Industrial Revolution [11; 12]. The rapid development of emerging technologies such as the Internet, the Internet of Things, and 5G communication networks has brought opportunities for people to make full use of the enormous value of network Big Data [13; 14]. Search engines have penetrated various fields: clothing, food, housing, and transportation, etc. The Baidu Index is based on Baidu [15], a search engine with a user scale of 795 million, it collects massive amounts of netizen behaviour data. This study is the first attempt to explore the online behaviour of the public to retrieve “knowledge management”. The purpose of this paper is to investigate the spatiotemporal characteristics of the Chinese public’s attention to knowledge management.

Materials and Methods

The study covered the territory of China. This study uses “knowledge management” as the search keyword to study the online search trend, demand map and population portrait of “knowledge management” from January 1, 2011, to January 1, 2022. At the same time, the related keyword “knowledge management system” of “knowledge management” is compared with the search trend in the same period to evaluate the spatiotemporal characteristics (phenomenon in a certain location and time) of knowledge management by the public in different periods.

The data presented by the Baidu Index Demand Graph is the relevant search term demand shown by the user in the change of search behaviour before and after searching for a certain term. Microsoft Excel was used to analyse the collected information. Based on this, one can analyse which keywords the user has a demand for in addition to the keyword and develop derivative products for the industry and products and services for reference. The demand map summarises the data in one year with the “week” as the statistical unit.

However, the Baidu Index can only be used in the Baidu search engine, and the data source is limited to China. Therefore, this study did not evaluate data obtained by other search engines. Although Baidu Index can analyse trend research, demand maps and crowd portraits, it cannot obtain demographic data for the time being. Baidu Index collects data based on keywords and does not analyse the motivation behind the search behaviour of searchers.

Results and Discussion

The study found that the search trend of “knowledge management” peaked at the end of 2016, and the trough appeared around the Chinese New Year and China’s National Day every year (Fig. 1). This study summarises and ranks the popular search terms related to “knowledge management” in the past year (Fig. 2), and finds that “learning organisation”, “knowledge base”, and “information management” are the hot words that concern the public the most.
Figure 1. Baidu search volume index in China for “knowledge management”: A – The overall search trend index; B – Personal computer search index; C – Mobile wireless search index

Source: [15]

Figure 2. Word cloud of search popularity of words related to “knowledge management”

Source: [16]
The geographical distribution of the Baidu Index functional module group portraits suggests that Eastern China and Northern China pay more attention to “knowledge management”, and Beijing’s attention to “knowledge management” ranks first in both provinces and cities (Fig. 3). The crowd attributes in the crowd portraits of the Baidu Index function module show that age 20-29 (40.07%) and men (53.78%) are the main sources of people who search for “knowledge management” – related content (Fig. 4). Meanwhile, search trends for “knowledge management system” and “knowledge management” were similar (Fig. 5).

**Figure 3.** Baidu Index maps for “knowledge management”: A – province; B – city

**Source:** authors’ own research
Figure 4. Demographic profiles by age (A) and gender (B)

Source: authors’ own research

Figure 5. Baidu search volume index for “knowledge management” (blue line) vs “knowledge management system” (green line)

Source: [15]

Mobile Trends presents data from January 2011 to the present (the search trend in other periods was stable). The main reasons for the peak in the search trend of “knowledge management” at the end of 2016 are as follows: firstly, on December 13, 2016, the national standard “Intellectual Property Management Regulations for Colleges and Universities” (GB/T 33251-2016) was approved by the National Quality Supervision of the People’s Republic of China Released by the General Administration of Inspection and Quarantine and the Standardisation Administration of China. Intellectual property, also known as “knowledge (property) ownership” and “intelligence (property) ownership”, refers to the rights that the right holder enjoys according to the law to the results of one’s intellectual labour [17]. Intellectual property management is an essential part of enterprise knowledge management. For innovative enterprises and knowledge enterprises, intellectual property management will become the core of enterprise knowledge management. Colleges and universities are the cradle of knowledge and the origin of national technological innovation. According to statistics, 70% of the important scientific and technological achievements affecting people’s lives come from inventions in colleges and universities.

Strengthening the management of intellectual property rights in Chinese universities is of immense importance for enhancing the core competitiveness of China’s
technological advance in the world [18], and the management of intellectual property rights in universities is of great significance. The release of this specification has attracted widespread attention. Secondly, the online academic journal “Knowledge Management Forum” published by the “Library and Information Work” journal was newly revised in 2016 and formed a new editorial board. “Knowledge Management Forum” is the only professional academic journal in the field of knowledge management, focusing on all knowledge-related research results and practical cases, including Internet and knowledge innovation, Big Data and knowledge computing, data guardianship and knowledge organisation, community of practice and knowledge operation Content management and knowledge sharing [19].

The valley value of “knowledge management” generally occurs around the Spring Festival and National Day each year. Every year from the end of January to the beginning of February is the most grand and traditional festival in China, the Spring Festival. The Spring Festival and the National Day are both legal holidays in China, and the vacation time is generally seven days. Whether it is the Spring Festival or the National Day, people will stop working or study to celebrate the festival, which leads to a decrease in the search index of “knowledge management” each year.

From the perspective of the trend, the overall PC terminal shows a downward trend, while the mobile phone terminal shows an upward trend. The number of netizens using mobile phones in China is enormous. According to the China Internet Network Information Centre, the number of mobile netizens in China is 1.007 billion, an increase from December 2020 [15]. There are 20.92 million mobile netizens, and 99.6% of netizens use mobile phones to access the Internet [15]. Evidently, mobile phones have successfully become the preferred way for people to communicate with the world due to their advantages of simple operation and convenient carrying, which naturally leads to an increase in the search trend for mobile phones and a decline in the search trend for personal computers.

This study summarises the top ten related words of “knowledge management” weekly search popularity from December 2020 to December 2021, and the top 10 related words with the highest popularity words were recorded (Table 1). Among them, “learning organisation” and “knowledge base” are the most frequently searched. “Learning organisation” refers to “an organisation that can effectively create, acquire and transform knowledge, and can adjust its own behaviour according to new knowledge and innovative ideas” [20]. “Knowledge base” is a collection of interrelated facts and knowledge stored in a computer according to certain requirements and is a collection of knowledge that has been classified, organised, and sequenced [21; 22]. The above definitions show that learning organisations are based on information and knowledge, and knowledge management and learning organisations have an inseparable and close relationship. Learning organisations are one of the carriers for knowledge management to be implemented, and knowledge management is learning the core and essence of the organisation. When the search user looks up “knowledge management” in the Baidu index, the keywords “learning organisation” and “knowledge base” with high correlation are also included in the search content and have the highest search frequency.

### Table 1. Top 10 search terms related to knowledge management in the Baidu Index

<table>
<thead>
<tr>
<th>Order</th>
<th>Keywords</th>
<th>Frequency, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Learning organisation</td>
<td>23</td>
</tr>
<tr>
<td>2</td>
<td>Knowledge base</td>
<td>21</td>
</tr>
<tr>
<td>3</td>
<td>Information management</td>
<td>14</td>
</tr>
<tr>
<td>4</td>
<td>Knowledge</td>
<td>10</td>
</tr>
<tr>
<td>5</td>
<td>Knowledge management system</td>
<td>10</td>
</tr>
<tr>
<td>6</td>
<td>Knowledge economy</td>
<td>6</td>
</tr>
<tr>
<td>7</td>
<td>Landray group</td>
<td>5</td>
</tr>
<tr>
<td>8</td>
<td>Process reengineering</td>
<td>5</td>
</tr>
<tr>
<td>9</td>
<td>Knowledge graph</td>
<td>3</td>
</tr>
<tr>
<td>10</td>
<td>Information resource management</td>
<td>3</td>
</tr>
</tbody>
</table>

The crowd portraits of Baidu Index can focus on which regions users come from. Geographical distribution data has been provided since July 2013. It shows that the search behaviour of users in the four regions of Beijing, Shanghai, Guangzhou, and Shenzhen are more common (Fig. 4). Both Beijing and Shanghai ranked top-two in terms of provincial rankings and city rankings. The reason Beijing ranks first is related to the journal “Knowledge Management Forum”. At present, knowledge management has been applied to agriculture, industry construction, transportation, post and telecommunications, business, education, health, finance, industry, etc.

This study selected the social attention data from December 1, 2011, to December 31, 2022 (Fig. 5). The gender ratio of men and women is 53.78% and 46.22%, respectively. According to age distribution, the 20-39-year-old group is 40.07% attentive, and the 30-39-year-old group is 39.58% attentive. The 20-39-year-old group represents the attention of scientific researchers and company management. Groups aged 40-49 paid less attention (14.51%); people under the age of 19 paid 3.54% attention; people over the age of 50 paid the least attention, only 2.29%.

At present, the Chinese economy has shifted from a stage of high-speed growth to a stage of high-quality
development. Knowledge management is the driving force for economic development. Knowledge management is applied in various fields, including in cultivating the core competitiveness of the organisation; in knowledge innovation; in new product development; in marketing, etc. [23]. Knowledge management (KM) has become a priority for organisational competitiveness and advantage because of the benefits it adds [24].

M. Binalhaj et al. pointed out that knowledge management is a management function that an organisation conducts to obtain long-term benefits, including creating or acquiring knowledge, managing knowledge dissemination within the organisation, and ensuring the effective use of knowledge [25]. In F. Caputo et al. research, knowledge management can be defined as the process of aligning knowledge sources with knowledge needs to enhance competitiveness [26]. This process is conducive to achieving management effectiveness through knowledge sharing and knowledge execution, not just knowledge storage [27]. The common feature of the above definitions is that they all explain that the process of knowledge management is complex and needs a series of factors to support, including strategy, culture, evaluation, technology, etc. [28]. Olubunmi concludes that knowledge management is critical for organisations that seek to ensure sustainable strategic competitive advantage [14].

In turn, the results of the presented study showed that the intellectual property management is an essential part of enterprise knowledge management. In addition, the authors are convinced that for innovative enterprises and knowledge enterprises, intellectual property management will become the core of enterprise knowledge management. Thus, it can be argued that the findings of this study coincide with the statements of other researchers in this subject area.

Conclusions

Strengthening knowledge management is of great significance for improving the China’s international competitiveness and comprehensive national strength, as well as achieving China’s goal of being an innovative country. The comparison of the PC terminal and the mobile terminal showed that the search trend of the PC terminal is inconsistent with the search trend of the mobile terminal. The results of the study indicate that the factors affecting the changes in the search volume of “knowledge management” mainly include the traditional Chinese holidays, the Spring Festival, the National Day, and the release of knowledge management-related norms.

Sorting out and gathering knowledge management data information is helpful to analyse the public’s search behaviour and psychology. Based on the Baidu Index, it is possible to understand the online attention to knowledge management in different regions and different genders in China, to analyse the user psychology and the needs behind the search behaviour. More in-depth research on knowledge management Baidu index needs to be continuously developed and improved in future practices.

References

Використання індексу Baidu для вивчення просторово-часових характеристик управління знаннями в Китаї

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Анотація. Актуальність статті пояснюється тим, що економіка знань вимагає управління знаннями, яке є новим типом менеджменту, який виник за часів економіки знань. Метою цієї статті є дослідження просторово-часових характеристик суспільної уваги до управління знаннями в Китаї. Провідними методами дослідження були аналіз, синтез, порівняння, дедукція, індукція. Це дослідження використовує індекс Baidu для аналізу просторово-часових характеристик уваги громадськості до управління знаннями. Зазначається, що тенденція пошуку “управління знаннями” за останні 11 років досягла свого піку наприкінцеві 2016 року, а зниження спостерігалося щороку під час Національного дня. Було зазначено, що групи, які цікавляться “управлінням знаннями”, в основному знаходяться в Гуандуні, Пекіні та Шанхаї. Фактори, які впливають на зміни обсягу пошуку “управління знаннями”, включають традиційні китайські свята – Свято Весни, Національний день і випуск норм, пов’язаних з управлінням знаннями. Крім того, дослідження виявило подібні пошукові тенденції для “управління знаннями” та “системи управління знаннями”. Зроблено висновок, що системи управління знаннями використовуються лише тоді, коли обсяг і складність накопичення знань всередині організації досягають певного рівня.

Ключові слова: економіка знань, система управління, пошукова система, комп’ютерна соціальна наука