Research on analytical customer relationship management in China: knowledge map analysis based on Citespace

Yang Jie[1]*, Nurkhalida Binti Makmor[2], Asad Ur Rehman[3]
[1,2,3]Management And Science University, Shah Alam, Malaysia; 012021091085@gsm.msu.edu.my (Y.J.)
nurkhalida_makmor@msu.edu.my (N.B.M.) asad_ur@msu.edu.my (A.U.R.)

Abstract: With the rapid development of the social economy, customers have become the most critical resources of companies, and many companies have taken analytical customer relationship management (CRM) as the magic weapon to improve their core competitiveness. As the main driving force of global economic growth, China currently occupies an essential position in the worldwide economy. Using CiteSpace information visualization software, this paper quantitatively analyzed the relevant research of 98 Web of Science (WoS) studies and 616 Chinese papers in China National Knowledge Infrastructure (CNKI) from 2003 to 2023 regarding analytical CRM in China. The research results of analytical CRM in China draw a knowledge mapping to sort out the annual publication volume, topic, publishing institution, and keyword. It was found that Chinese scholars have focused on analytical CRM in China during the last 20 years, and it entered a relatively rapid growth period in 2013, forming a relatively complete body of knowledge. However, the overall number of publications in WoS is low, and the research field is narrow. According to the data, foreign scholars' research has certain limitations, primarily focusing on applying concepts in information technology. The layout between different research topics is scattered and the correlation is low. This paper provides a comprehensive analysis to point out the direction for researchers in the area of analytical CRM to engage in related research, provide data reference, and help to predict the future trend of this research. Future research should fully use big data and information technology and focus on analytical CRM in the network era to help Chinese companies improve their competitiveness.

Keywords: Analytical customer relationship management, China, Cite space, Knowledge map.

1. Introduction

In the trading market, many aspects of the development of business problems need to be further studied, especially the research on customer relationship management (CRM) in the e-commerce environment (Santoso, 2021). CRM has become the essential strategy to maintain customers for firms regardless of size through acquiring, maintaining, and connecting with selective consumers to create superior value for the organization and the individual (Fluss, 2010). To be more precise, Buttle and Maklan (2019) identified CRM in terms of three types: analytical CRM, strategic CRM, and operational CRM, in which analytical CRM is responsible for acknowledging consumers through customer information analysis (Almohaimmeed, 2021)

Numerous facts about the challenges of business evolution in the trading market, particularly the study of CRM in the context of e-commerce, require additional investigation (Santoso, 2021). CRM has emerged as a critical tactic for businesses of all sizes to retain clients by attracting, retaining, and cultivating relationships with specific customers to generate higher value for both the company and the person (Fluss, 2010). More specifically, analytical CRM is in charge of recognizing customers through customer information analysis and is the process of converting customer data into a format that can be

used to accomplish business strategic marketing goals and enhance organizational competitiveness (Gunawan et al., 2013), according to Buttle and Maklan's (2019) classification of three forms of CRM: analytical, strategic, and operational (Almohaimmeed, 2021).

Businesses using analytical CRM must use online operations to find, develop, and keep consumers (Xu & Walton, 2005). The relevance of analytical CRM is demonstrated by the fact that companies have made significant investments in business development recently to better manage their communications with customers both during and after purchases (Bohling et al., 2006). At the Sixth APEC Economic Leaders' Meeting, Jiang made it apparent since 1998 that Chinese enterprises with robust CRM indicate the direction of development in the future trading mode (Shooshtari et al., 2000).

However, analytical CRM is a crucial component of CRM since CRM is the belief that offers made to buyers are based on information technology (Khodakarami & Chan, 2014). Analytical CRM is a holistic marketing and business strategy integrating customers and all business activities to attract people. It can also assist companies in creating enduring relationships with their buyers (Girchenko et al., 2017). As a result, using analytical CRM has drawn constant attention to developing and maintaining corporate competitiveness. As many academics have indicated, if businesses wish to increase productivity, they should shift their focus to understanding analytical CRM (Jensen, 2001; Slater, 1997). Thus, analytical CRM allows data analysis to solve fundamental issues like acquiring new clients, keeping existing ones, and maximizing consumer value (Lokuge et al., 2020). These issues have recently gained attention as hot research topics and require immediate attention from businesses worldwide (Kabasakal, 2020).

Few studies have examined the significance of analytical CRM for Chinese companies, even though previous research has mainly concentrated on information technology and humanistic management for the global market, particularly for developing nations (Lokuge et al., 2020). Organizations in China have realized in recent years that there are a few significant obstacles that prevent them from being able to guarantee company success with confidence. One of the key ones is the absence of analytical CRM available to keep clients (Saha et al., 2021). For Chinese businesses, developing a solid analytical CRM is crucial (Attia, 2023). Therefore, it is imperative to address this weakness.

Bibliometric analysis allows researchers to draw a clear picture of a specific research field in terms of its origin, current status, and development, which helps researchers better formulate future research revenues (Cui et al., 2018). This study adopted a bibliometric method to conduct a scientific research collaboration analysis on the collected documents and used CiteSpace as the bibliometric tool to represent the findings visually. Applying the Citespace software, based on the data, 616 Chinese studies on analytical CRM in CNKI and 98 English studies on analytical CRM in WoS – a total of 714 studies. This research analyzes the development course, research status, and potential trends of analytical CRM in China. It comprehensively explores the relevant literature on Chinese analytical CRM from each source. It analyzes the annual publication count, research institutions, highly cited studies, literature keywords, subjects, and research hotspots. Finally, based on these findings, the potential development trends of Chinese analytical CRM will be discovered, enabling scholars and practitioners to understand the related research development better, providing valuable references for policy issues in some countries, and for subsequent research.

2. Literature Review

The Group formally proposed CRM, one of the essential marketing and management methods, in the middle of the 1990s (Osarenkhoe & Bennani, 2007). Ives and Learmonth introduced the idea of the customer life cycle (CRLC) in 1984. They claimed that CRM began with supporting and satisfying customers' expectations at each stage of the CRLC (Romano & Nicholas, 2000). Additionally, from a management perspective, some scholars believe that CRM originated from the contact management concept in the early 1980s, which focused on gathering data regarding interactions between people and companies (Frow & Payne, 2009). Customers' needs are becoming more varied and higher quality, and market operations are shifting from being enterprise-centered to being customer-centered in the age of

the knowledge economy and information economy (Ullah et al., 2020). Additionally, companies are becoming more conscious of how tough it is to manage their customers and their importance. This has led to developing customer resources into a fantastic asset for business growth (Edvardsson et al., 2006). Consequently, with its robust technical support, CRM starts implementing the centralized management of the customer information database online and synchronizing it with the function modules application software. This ensures data consistency between the various business units and function modules (Santoro et al., 2017).

To obtain valuable information and comprehend customer lifetime value, credit risk, and buying propensity, analytical CRM, also known as back-office CRM, is applied to analyze customer activities occurring in the front office and emphasizes the analysis of distinctive data based on data warehouse (Onut et al., 2008). This is done through data mining, OLAP (online analytical processing), interactive queries, and reports (Ayyagari, 2019). However, valuable information suggests that knowledge derived from information could provide a solid foundation for customer service and research and development of new goods (Nelson et al., 2020). Consequently, to better understand customer consumption patterns and classify customers, formulate corresponding marketing strategies, and develop corresponding products or services to satisfy individuals, the analytical CRM system elevates the original customer information management system to a higher level. It analyzes business intelligence and customer behaviors, customer demands, consumption habits, and behavior patterns by establishing data warehouses, data mining, business intelligence, and other technical means (Ranjan, 2010; Sundjaja, 2013).

Analytical CRM, introduced in early 1998, is centered on examining customer data, encompassing basket analysis, focused marketing, and customer descriptions (Iriana & Buttle, 2007). In more detail, the purpose of customer descriptions is to pinpoint the traits of exceptional clients to forecast who will turn into such clients (Ayyagari, 2019); basket analysis can fully utilize the buyer's profile to assist them better and offer guidance on purchases, thereby performing an excellent job of targeted marketing (Liu et al., 2018). Furthermore, Qing Guo, a marketing specialist, proposes that analytical CRM comprises diverse marketing concepts, tactics, and strategies; it also arranges channels of distribution based on shifts in customer behavior and uses related data to plan and carry out strategies related to distribution, promotion, and services (Guo & Mai, 2022). SYBASE divides the analytical CRM system into seven basic modules (7P): Profiling, Promotion, Persistence, Performance, Profitability, Prospecting, and Product. Each module can work with the others to better comprehend and hone the factual needs of people in marketing, increase customer loyalty, identify valued customers, and unlock their potential value (Waseem, 2018). Personalized customer service, customer acquisition and customer dynamics analysis, customer churn analysis, customer profit contribution analysis, customer satisfaction and loyalty analysis, and customer profit contribution analysis are among the features of analytical CRM, according to Professor Jinxiang Dong of Zhejiang University (Guo & Huang, 2015). According to American researcher Puschmann, analytical CRM consists of customer market segmentation, cross- or up-selling, customer maintenance, and customer profit return forecast (Alt & Puschmann, 2006).

In conclusion, Yisheng Lan addresses the rationale behind maximizing a company's profits (Ayyagari, 2019). According to Xie and Rui (2010), analytical CRM is the process of establishing, preserving, and improving relationships, luring, holding onto, and upscaling clients. Accordingly, the goal of implementing analytical CRM is not only to broaden business horizons and alter enterprise management practices (Vignesh, 2010); it also aims to improve the relationship between businesses and individuals; it gathers and analyzes detailed consumer data of all kinds to create effective marketing strategies (Rosemann et al., 2012); and, lastly, it accomplishes the goal of increasing sales and cross-selling to boost customer trust (Crone et al., 2005).

3. Methodology

3.1. Data Sources

Following Fetscherin and Heinrich's (2015) and Dzikowski's (2018) data sources, this study uses datasets downloaded from the Web of Science (WoS). Web of Science is the most complete research

platform for data in the social sciences, hard sciences, humanities, and arts, referred to as the most trusted publisher-independent worldwide citation database. On the other hand, this study aims to demonstrate analytical CRM in China, so data sources are searched with CNKI. This premier academic literature database is updated continuously in China. These two databases contain almost all authoritative literature in English and Chinese. To obtain as many relevant interdisciplinary publications as possible for this study, we searched for publications for which the subjects included "analytical CRM" and "China," and the time was set to 21 years (from 2003/1/1 to 2023/12/31). Ninety-eight studies in English were eventually obtained from WoS. CNKI was applied to search studies in Chinese. After searching for studies with "analytical CRM" (fenxixing kehu guanxi guan li) and "China" (Zhongguo) as the subjects, 616 Chinese papers were published from 2003 to 2023. The date of this search was March 5, 2024, and 714 references, as the dataset, were used to analyze further.

3.2. Data Processing

CiteSpace is an information visualization software developed based on the Java environment, and its primary use is bibliometric analysis, which is highly efficient for identifying overall trends in the field, such as seminal literature, critical literature, and mainstream topics (Chen, 2006). Based on the analysis of keyword frequency, linkage strength, and literature co-citation, CiteSpace visualizes the evolution of research topics in different periods and serves as the primary basis for sorting out the basic knowledge and research characteristics and detecting the frontier and development trends of the discipline. The data on literature from CNKI and WoS were preprocessed using the integrated CiteSpace data converter before mapping because it uses the WoS textual data format. To guarantee precise outcomes, duplicates were eliminated from the WoS and CNKI data by screening them after format conversion.

CiteSpace 5.2.R4, a bibliometric tool developed by Prof. Chaomei Chen, was created with scientometrics and knowledge visualization in mind. Its primary function is identifying potentially helpful knowledge in scientific publications (Chen, 2016). With this program, scholars can find classic literature in the field, comprehend the fundamentals of the subject, identify research horizons, and make sense of the context in which the field has evolved. The three notions developed within the framework of this mapping function concept are crucial to resolving the following three issues because CiteSpace converts research domain concepts into mapping functions between research frontiers and intellectual bases: Determine the character of the research frontier (a), annotate the topic of study (b), and recognize emerging patterns and changes over time (c). Researchers have used CiteSpace in over 100 countries, and over 15,000 papers have been published using CiteSpace (Ding & Yang, 2022).

3.3. Methodology

The dataset was then thoroughly examined, covering various topics such as subject and country distribution, co-occurrence of keywords, prominent research institutes and their collaboration, and the dataset's annual distribution. The annual distribution helps track the evolution of a field or subject. From an intermediate level, analyzing the major research institutions and their collaboration can provide insight into the distribution of research strengths in Chinese analytical CRM. Critical subjects in publications, keywords, and frontier knowledge of the discipline as a whole can be found by keyword analysis (Zhao & Xu, 2010).

CiteSpace can also generate cluster analysis, regarded as the most commonly used technique in bibliometric analysis (Hair et al., 1998). According to van Eck and Waltman (2017), cluster analysis is typically used to examine how similar relevant papers and emerging topics are. For example, a document co-citation cluster shows the clusters' structure for cited papers and the relationships among them. CiteSpace automatically extracts the names of clusters from the information input, including the title and keywords (Zhu & Hua, 2017). This study used the log-likelihood rate (LLR) because it produces the best results in terms of coverage and uniqueness (Chen, 2006). To determine the beginnings, progression, and present state of Chinese analytical CRM research, we also carried out a timeline study using CiteSpace. The clusters are arranged on a horizontal timeline in the timeline view,

making it easy to see how they have changed over time. This can assist academics in recognizing new trends. The temporal patterns of the results, which consist of a sequence of vertical strips sorted chronologically from left to right, are displayed using the time zone view (Chen, 2006).

CiteSpace's time barrier is set between 2003 and 2023, with a time slice of two years. The pruning was set as "pruning the merged network" and "pathfinder." Terms sources were title, abstract, author keywords (DE), and keywords plus (ID). Node types such as keywords and institutions were set for the analysis. To guarantee the map was clear, data from the ten nodes that appeared the most frequently each time were filtered to eliminate unnecessary information. The institution, keyword, category, and nation were sequentially chosen in the object analysis function panel as clustering bases after finishing the threshold configuration. Citespace's automatic clustering function was then utilized to create the scientific knowledge map.

4. Discussions

4.1. Analysis of Literature from WoS

4.1.1. Overview of Analytical CRM Studies in China from WoS

The amount of data from WoS is 98. After the processing of removing duplicates in CiteSpace, 98 papers can be used. In the last 20 years, international scholars have paid attention to analytical CRM. Figure 1 shows that the original research on analytical CRM in China from WoS in the designed time interval was published in 2003. Few papers were published in this field in 2003, 2004, and 2015, which means foreign scholars have not shown much interest in it thus far. The area did not gain much traction until 2006 when the body of work on Chinese analytical CRM in WoS significantly expanded. Finally, as of December, eight international studies on Chinese analytical CRM were published in 2023. In China, analytical CRM is a complex issue that requires multiple approaches.

Table 1 lists the important subjects covered by Chinese analytical CRM studies in WoS. Among the 98 papers, 48 come from Management, 13 come from Supply Chain & Logistics, and 11 are from Artificial Intelligence & Machine Learning. Each of these subjects is an important research field in WoS. Economic theory, security systems, design and manufacturing, and safety and maintenance are also important disciplines in analytical CRM in China and play essential roles in relevant research.
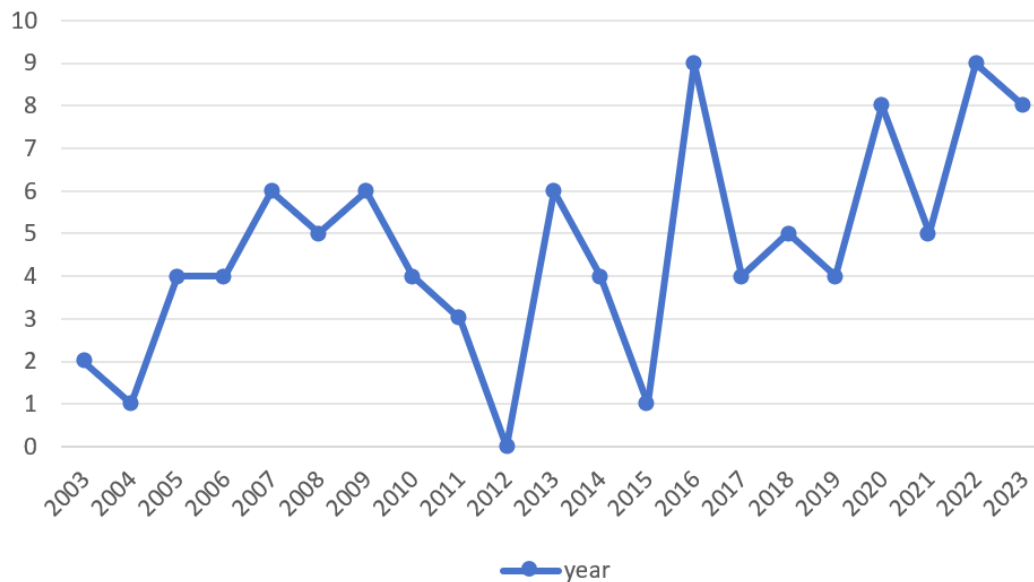

Figure 1.
Annual distribution of the studies on analytical CRM in China from WoS.
Source: Web of Science.

Table 2 demonstrates significant international studies related to Chinese analytical CRM issues. Among the ten most highly-quoted articles, D. Zhou et al. / Journal of Management Information Systems focuses on big data, information technology, and customer agility for analytical CRM research in the present Chinese market. Big data powerfully leads the trend of analytical methodology for companies to acquire business competitiveness. CRM can maintain customers, improve the financial and social performance of organizations, and promote enterprises' development. This is one of the core topics of Chinese analytical CRM research.

Table 1.
Topic distribution of studies on analytical CRM in China from WoS (Top 10).

Topic	Count
Management	48
Supply chain & logistics	13
Artificial intelligence & machine learning	11
Economic theory	3
Security systems	2
Design & manufacturing	2
Safety & maintenance	2
Social psychology	2
Molecular & cell biology - cancer, autophagy & apoptosis	1
Hiv	1

Source: Web of Science.

Table 2.
Top 10 most highly-cited studies on analytical CRM in China from WoS.

No.	Article title	Authors	Journal	Citation count	Year
1	Strategic sourcing: a combined QFD and AHP approach in manufacturing	Ho, W; Dey；PK Lockström, M	Supply Chain Management: An International Journal	96	2011
2	Churn prediction using comprehensible support vector machine: An analytical CRM application	Farquad, M. A. H.; Ravi, V.; Raju, S. B.	Applied Soft Computing	94	2014
3	Measuring customer agility from online reviews using big data text analytics	Zhou, S.; Qiao, Z.; Du, Q.; Wang, G. A.; Fan, W.; Yan, X.	Journal of Management Information Systems	92	2018
4	Drivers of consumers' behavioral intention toward green hotels	Teng, C.C.; Lu, A.C.C.; Huang, T.T	International Journal of Contemporary Hospitality Management	77	2018
5	Environmental sustainability of logistics service provider: an ANP-QFD approach	Lam, J.S.L.; Dai, J.	The International Journal of Logistics	75	2015

No.	Article title	Authors	Journal	Citation count	Year
			Management		
6	How community interactions contribute to harmonious community relationships and customers' identification in the online brand community	et al.	International Journal of Information Management	67	2016
7	Leveraging Smart Supply Chain and Information System Agility for Supply Chain Flexibility	et al.	Information Systems Frontiers	66	2019
8	Transformational leadership, corporate social responsibility, organizational innovation, and organizational performance: Symmetrical and asymmetrical analytical approaches	Khan, H.U.R. et al	Corporate Social Responsibility and Environmental Management	48	2012
9	Influence of customer verbal aggression on employee turnover intention	Li, X.Y.; Zhou, E.H.	Management decision	57	2013
10	The impact of customer knowledge and marketing dynamic capability on innovation performance: an empirical analysis	et al.	Journal of Business & Industrial Marketing	51	2017

Source: Web of Science.

4.1.2. Quantitative Analysis of the Studies of Analytical CRM in China from Wos
4.1.2.1. Research institutions

Table 3 shows the international institutions with high publication frequency. Most of the top 10 are Chinese, and Hong Kong Polytechnic University is at the top, based on study quantity and centrality of 0.08. From this, it is clear that Chinese scientific institutions have made outstanding contributions to Chinese analytical CRM research. Moreover, the City University of Hong Kong, Shanghai Jiao Tong University, University of Hong Kong, and Nanyang Technological University started publishing quite early; their respective centrality scores reached 0.05, 0.01, 0.02, and 0.01, respectively, indicating that their research results are worthy of reference by scholars from all over the world.

Table 3.
Top 10 institutions for frequently published studies on analytical CRM in China from WoS.

No.	Count	Centrality	Year	Institution
1	9	0.08	2005	Hong Kong Polytechnic University
2	4	0.05	2008	City University of Hong Kong
3	3	0.01	2013	Shanghai Jiao Tong University
4	3	0	2013	National Pingtung University Science & Technology
5	3	0.02	2005	University of Hong Kong
6	2	0	2008	Hunan University

7	2	0	2016	California State University System
8	2	0	2020	Central South University
9	2	0.01	2009	Nanyang Technological University
10	2	0	2022	Southwestern University of Finance & Economics - China

Source: Web of Science.

4.1.2.2. Research Hotspots

Figure 2 demonstrates how the hybrid network comprising the keywords from the 98 papers from WoS produced significant clusters.

The sub-clusters are generated at the end of each cluster time axis in Figure 3. These keywords represent the frontier topics in each cluster. This research may mainly categorize the studies into the top 5 cluster titles: outsourcing services, competition, customer relationship management, sourcing, and logistics flexibility by examining and summarizing the keywords of each cluster. For analytical standards, scholars explore criteria for judging the factors of outsourcing services. Therefore, the literature mainly involves definitions of customer satisfaction, absorptive capacity, service quality, and behavioral intentions of evaluation criteria (Gambal et al., 2022).

For business competitiveness, the cluster title is "competition." As cities have developed and expanded, analytical strategies have constantly changed, and coordination and business design have had various positive effects. Appropriate customer loyalty is especially significant for analytical CRM development, and supplier selection and decisions have gradually attracted more attention (Nazari-Shirkouhi et al., 2015). For the maintenance of customer relationships, the cluster title is "customer relationship management." Internet technology dominates marketing; thus, networks cannot be ignored while managing customer relationships. In addition, acquisition costs always influence customer relations because the amount of latent information companies' consumers can acquire depends on how much the organizations will pay for acquisition (Bolton & Tarasi, 2017). Furthermore, customer relationship management (CRM) can affect the performance of CRM and its moderating role.

For analytical systems, the cluster title is "sourcing." The rapid expansion of customers has caused problems such as excessive customer databases, outdated network systems, and out-of-sync services. These are significant challenges for customer retention (Gomber et al., 2018). Current research dimensions include the study of knowledge-based systems, online analytical processing, and analytic hierarchy processes relating to customer requirements. The cluster title for the operational models during analytical is "logistics flexibility." Supply chain management, data mining methods, and behavioral operations management have caused organizational operations to change. Customers, products, and choices are challenges for developing analytical CRM (Oliveira, 2012). An analytical framework is also a significant methodology for firms to pay attention to.
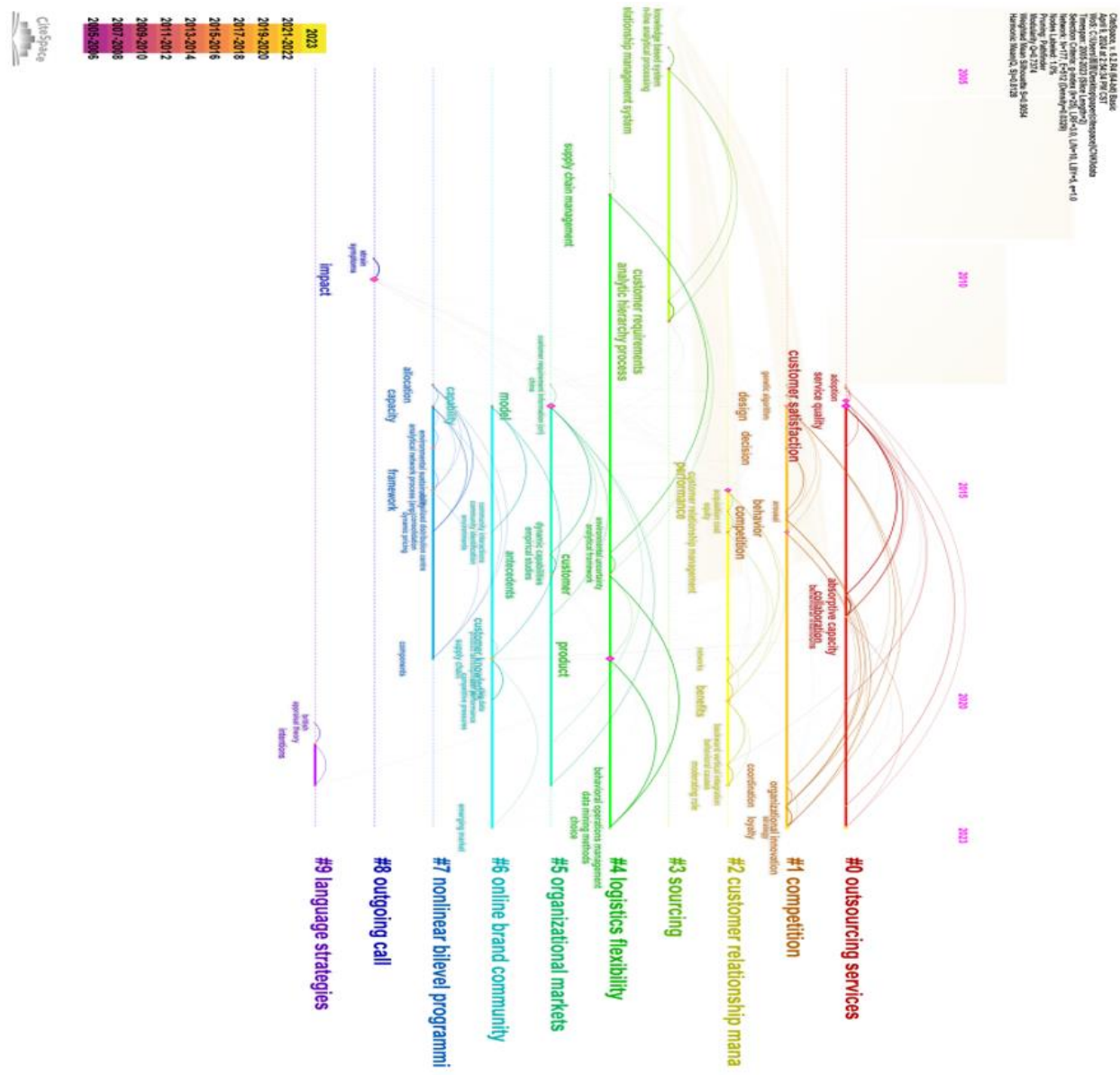
Figure 2.
Keyword timeline in the literature on analytical CRM in China from WoS
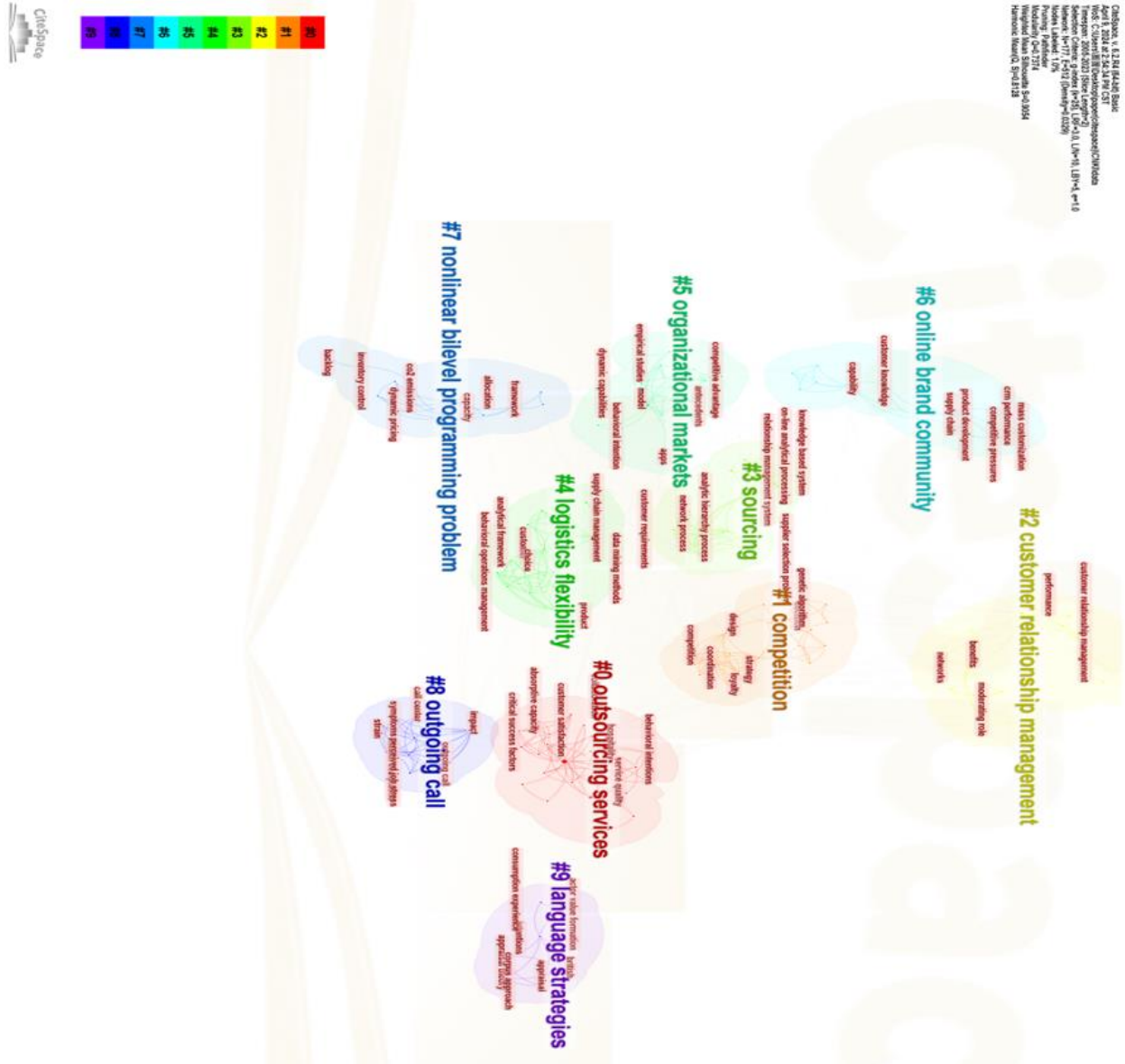**Source:** Web of Science.

Figure 3.
Keyword clustering in the literature on analytical CRM in China from WoS
Source: Web of Science.

4.2. Analysis of the Literature from CNKI
4.2.1.Overview of Analytical CRM Studies in China from CNKI

Chinese researchers have focused on analytical CRM in the 21st century. The first article in CNKI within the query scope set in this article was published in 2003. Figure. 4 shows that from 2003 to 2023, the number of studies on Chinese analytical CRM constantly changed, reaching a peak in 2015 at 53. Publication began to decrease gradually each year after 2014, with 16 studies at the end of 2022. As of December 2023, there were only 17 studies in 2023. Publication may continue to decrease in the future. The decline in publications in this field over the past few years in CNKI keeps almost the same trend as it is in WoS. Table 4, the distribution of disciplines of the studies on Chinese analytical CRM from CNKI, illustrates that analytical CRM is the main topic of Chinese research. Of the sample 232 Chinese

studies, 37.66% researched related issues. Another 33.27% were related to CRM, CRM systems, customer relationships, analytical, and data mining. Analysis of the most highly-cited references in CNKI showed the distribution of research directions. Table 5 lists the ten most highly-cited studies, of which seven discussed applied areas, models, and strategies of analytical CRM in China. Another three discussed the information technology used by analytical CRM, including data mining and software architecture. Four of these ten studies used theoretical research, three conducted descriptive research based on statistical data, while the remaining three are summary studies. Chinese research on analytical CRM dominantly uses a macro approach.
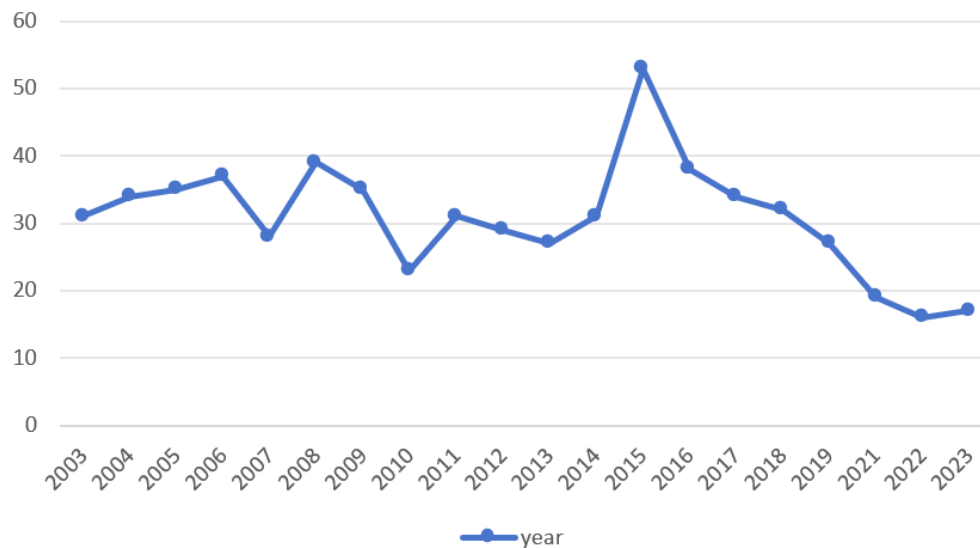

Figure 4.
Annual Distribution of Studies on Analytical CRM in China from CNKI.
Source: CNKI

Table 4.
Topic distribution of the studies on analytical CRM in China from CNKI (Top 10).

Topic	Count
Analytical CRM	232
CRM	55
CRM system	44
Customer relationship	41
Analytical	35
Data Mining	30
Enterprise customer relationship management	15
Analysis and design	15
Commercial bank	16
Analytical CRM system	15

Source: CNKI

Table 5.
Top 10 most highly-cited studies on analytical CRM in China from CNKI

No.	Article title	Authors	Journal	Citation count	Year
1	Analysis of CRM from different sides - the review of the papers of CRM	Li Lisha	REFORMATION & STRATEGY	229	2012
2	Customer relationship management, internal control and merger and acquisition performance - analysis of multivariate linear regression Model	Chen Xiaojun; Ji Fuxing	MANAGEMENT REVIEW	123	2021
3	Analysis of customer relationship management in commercial banks under the new situation	Wang, Yinming; Xu Mingyuan	CONTEMPORARY FINANCE	111	2018
4	Research on the current situation analysis and improvement path of enterprise customer relationship management	Tao Zhiyu	OPERATION AND MANAGEMENT	103	2021
5	The relationship between customer relationship management systems and corporate operational performance - a comparative analysis based on listed companies in the U.S. and China	Li Yangfan; Ge Fuhai	JOURNAL OF TECHNOLOGY ECONOMICS	94	2015
6	An applied study of analytical customer relationship management in small and medium-sized commercial banks	Huang Jinrui	MODERNIZATION OF MANAGEMENT	72	2014
7	Research on bank customer relationship management strategy based on customer value analysis	Guo Ling	TAXPAYING	72	2019
8	Data mining analysis of customer segmentation in customer relationship management	Qu Jialiang; Lv Shuyi	FORUM	60	2015
9	Mechanism analysis of customer relationship and working capital management	Wang Xin	COMMERCIAL ACCOUNTING	59	2017
10	Software architecture for analytical CRM	Li Haiming et al.	COMPUTER ENGINEERING AND APPLICATIONS	56	2003

Source: CNKI

4.2.2. Quantitative Analysis of the Studies of Analytical CRM in China From CNKI
4.2.2.1. Research Institutions

As shown in Table 6, Tianjin University School of Management has three publications on analytical CRM, and others have two publications separately. Furthermore, the centrality of each institution is 0, indicating that the research strength in this field is dispersed, with no aggregation or scaling effects.

Table 6.
Top 10 institutions for frequency of published literature on analytical CRM in China from CNKI.

No	Count	Centrality	Year	Institution
1	3	0	2006	Tianjin university school of management
2	2	0	2009	Shandong university of architecture library
3	2	0	2003	Shenyang institute of automation, Chinese academy of sciences
4	2	0	2008	College of economics and management, Vanshan university
5	2	0	2019	Jincheng college of Sichuan university
6	2	0	2004	School of management, Xi'an Jiaotong university
7	2	0	2009	School of management, ocean university of China
8	2	0	2009	Northeast university of finance and economics
9	2	0	2015	Anhui university
10	2	0	2013	Liaoning college of foreign trade and economics

Source: CNKI.

4.2.3. Research Hotspots

Figure 5 shows a timeline of keyword co-occurrence in the CNKI literature. There are five essential clusters in the 288-node hybrid network (Figure 6). They can be summarized as five hot topics: CRM strategy, data mining methods, marketing analysis, customer maintenance strategies, and customer classification. The cluster title for the strategy of analytical CRM is "customer relationship management." Service models, customer information systems, culture building, grass-roots e-universities, and database design are all magnificent dimensions to embark on CRM. CRM strategies not only require data marts and mass spatial databases but also drive customers' insurance. With the rapid development of modern information technology, new technologies such as cloud computing and artificial intelligence have updated and optimized the methods of communication between companies and their customers, thus promoting the development of customer relations. Interaction between customers is no longer limited to sales and after-sales service, and the new customer relationship management model will create new profit growth points for enterprises (Huang & Zhou, 2023).

Through data mining, it can understand the hobbies and lifestyles of customers; Provide a specific direction for the development of the enterprise, compete for more customers, produce marketable products, and obtain a more significant market; Analyze the customer's consumption information, and formulate the relevant product marketing strategy; Realize the effective management of the customer, and at the same time, formulate the relevant personalized service for the customer (Lian, 2016). For marketing analysis, the cluster title is "customer relations." Customer relations is a systematic project that involves multiple complex factors such as value analysis, instrument design, market development, and information sharing. It is closely tied to companies' long-term strategic business development. The positive interaction between enterprises and supply chain participants under the goal of China-style modernization is a prerequisite to ensure high-quality development. Based on the stakeholder theory and transaction cost theory, customer relationships can help reduce the financial risk of enterprises and obtain more excellent market benefits (Zhou et al., 2024).

For customer maintenance strategies, the cluster title is "customer relationships." 3G communication, integrated supply chain, real estate, communication firms, and management countermeasures make it necessary for Chinese companies to seek more development methods to acquire and maintain consumers, not only from companies' inner but also from outside assistance. Customer relationship refers to establishing a long-term, stable, and mutually beneficial relationship between an enterprise and its customers, which includes both enterprises and consumers. In the current buyer's market, the proximity to the end customer significantly affects the upstream enterprise's mastery of demand information; therefore, constructing good customer relationships, utilizing various

means, and striving to overcome the negative impact caused by asymmetric information has become an essential driving force for enterprises to improve their market share (Yang & Tian, 2015).

For customer classification, the cluster title is "customer lifetime value (CLV)." Analysis and segmentation of customer value have always been the issue of most concern, and improvement paths, fit principles, and customer perceived value are the most prominent keywords in this cluster. With the progress of computer technology, more and more enterprises realize the importance of CLV; enterprises can use the customer's historical transaction data to calculate the customer's historical value, current value, and potential value, which, from a scientific point of view to provide the basis for the enterprise to carry out the development of marketing strategy. With the advent of the significant data era comes exponential growth in the amount of data and the consequent increase in the cost of storage, operation, and maintenance. Therefore, the use of analytical customer relationship management to give full play to the role of its data so that the data to feed the enterprise performance improvement has become the focus of more and more enterprises (Xiao et al., 2023).
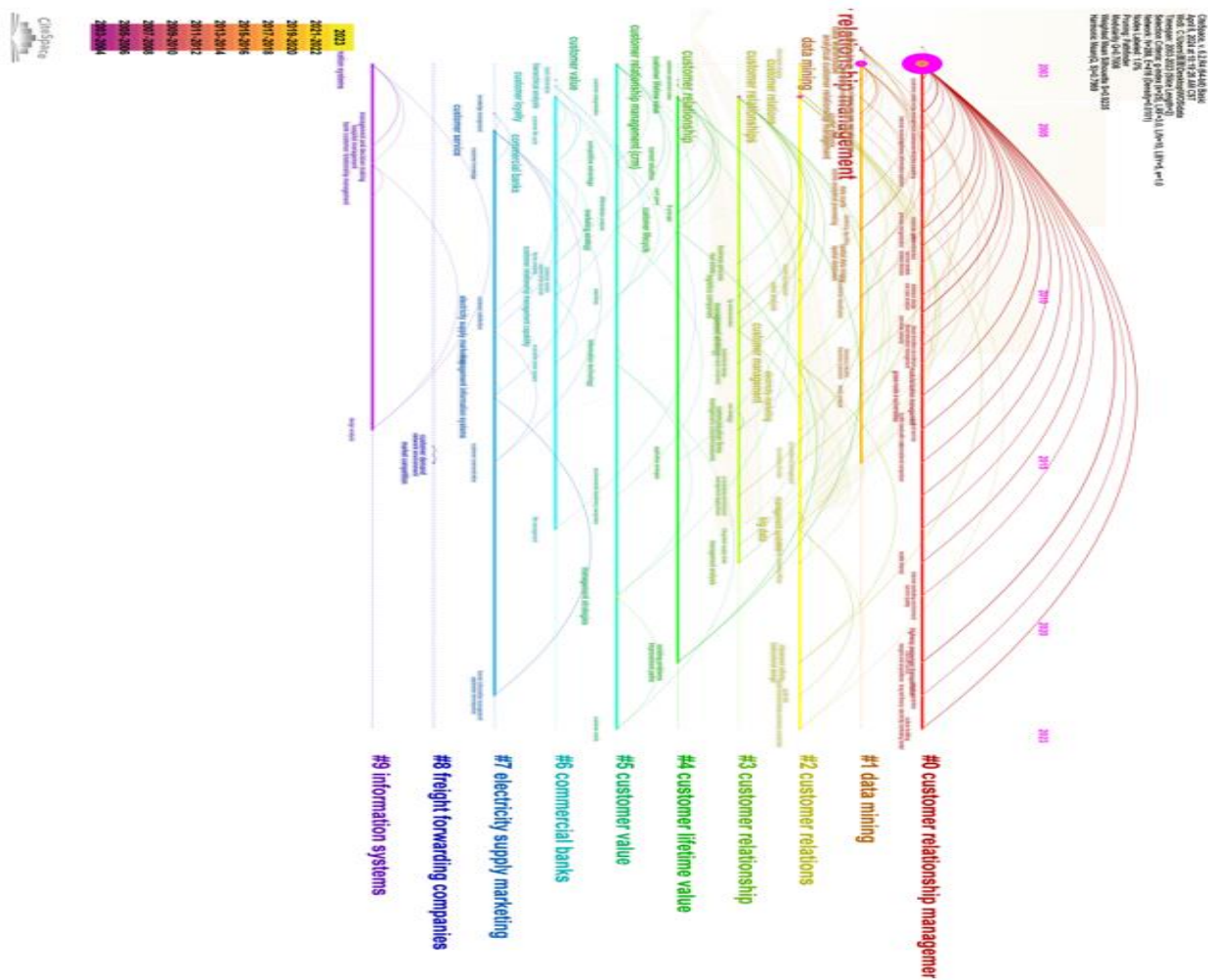

Figure 5.
A keyword timeline view of the literature on analytical CRM in China from CNKI.
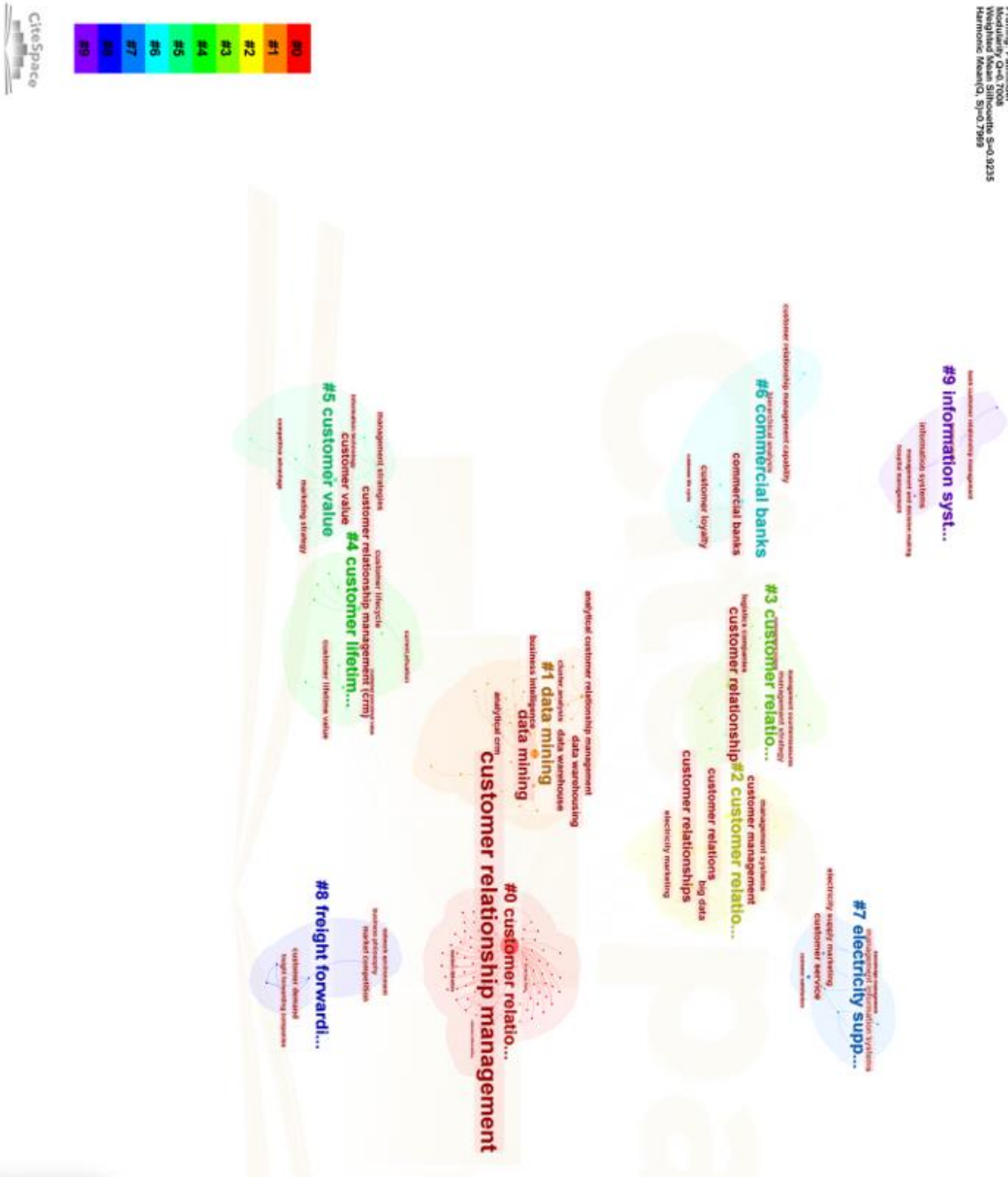**Source:** CNKI.

Figure 6.
Keyword clustering of the literature on analytical CRM in China from CNKI.
Source: CNKI

5. Conclusion

Upon compiling and organizing the literature on analytical CRM in China on the Web of Science (WoS), we discovered that surprisingly few significant studies have been conducted in this area. A literature study restricted to English-language databases may result in partial or biased conclusions because many significant studies conducted by Chinese experts have been published in Chinese. Keeping

this restriction in mind, this study has used the bibliometric method to examine the current state, future directions, and potential trends of analytical CRM research in China. A sample of 98 English studies in WoS and 616 Chinese studies in China National Knowledge Infrastructure (CNKI) were used for 714 related studies. The pertinent literature in WoS and CNKI has been thoroughly examined by CiteSpace software, and a network analysis of the publications' amount, subject distribution, highly cited studies, research institutions, and literature keywords by year has been carried out. After that, we compared the two databases and identified important research platforms, institutions, subjects, and research hotspots in the field.

Chinese scholars have focused their research on analytical CRM in China during the last 20 years and entered a relatively rapid growth period in 2013, forming a relatively complete body of knowledge. The existing research has extended from basic concepts and theories to commercial banks, the Internet, and IT applications, reflecting various outreach characteristics. At present, the uncertainty risks and challenges facing the Chinese market continue to intensify; analytical CRM research focuses on customer relationships, customer value, and other focal issues and studies information technology strategies to provide scientific support for promoting and contributing to the sustainable development of Chinese enterprises. Furthermore, International scholars' research on analytical CRM in China entered a rapid growth period in 2008 from 2003 to 2023. However, it experienced a downturn in research from 2013. The number of publications is low, and the research field is narrow. According to the data, foreign scholars' research has certain limitations, mainly focusing on applying concepts in information technology. The layout between different research topics is scattered and the correlation is low.

5.1. Significance of the Study

Using CiteSpace as a research tool for bibliometric analysis, this study explores the research development of analytical CRM in China in the global field. In this research, WoS and CNKI are applied as the primary databases, and they serve as the authoritative engines for internationalized literature search and Chinese literature search in terms of quantity and quality, respectively. Therefore, this study provides theoretical and literature support for analytical CRM.

First, through literature analysis, this study visualizes the development of analytical CRM in China during the 20 years from 2003-2023, which can clearly and distinctly show the difference in the depth of research on analytical CRM. Secondly, this study can identify the current research frontiers through the visual analysis of analytical CRM, provide directions for the business strategies and market positioning of enterprises, and sort out the critical parts of CRM for company managers or owners. In addition, through the CiteSpace software, we can measure and analyze the current status of research in China and abroad, see the focus of Chinese researchers and foreign researchers, and help domestic researchers fill the current gaps to broaden the field of research. At the same time, the analysis of cooperative institutions in CiteSpace reflects the frequency of cooperation among institutions, which provides more opportunities for institutions to cooperate in researching such topics. Finally, in the keyword timeline of CiteSpace, the research content of different nodes is also different, and the keyword clustering is also different. Through the visual analysis of keyword clustering and timeline, the degree of development of analytical CRM at the corresponding point in time and the centrality of keywords can be directly and clearly shown, reflecting society's development trend and the changing market shape.

5.2. Limitations and Future Directions

As an analytical, predictive, and comprehensive CRM system, analytical CRM in China has significant regional and stage-specific characteristics. Currently, China vigorously promotes the development of small, medium, and micro enterprises. Therefore, in the context of the Internet economy, analytical CRM should be promoted in China. However, the data used in this analysis came from the WoS and CNKI databases, which contain comparatively high-quality papers, albeit in relatively small numbers. The WoS and CNKI databases do not contain many research results published

in other journals, and these results were not gathered for this study. As a result, the results' representativeness has some limitations.

To overcome these issues, researchers must do more studies in the future. Firstly, analytical CRM should be promoted in regions and enterprise sizes at different stages of development to explore how to gain enterprise competitiveness through it. This study collected information and searched literature in China. For further development, scholars can research different company sizes and other countries to discover the application and innovation of analytical CRM. Secondly, WoS and CNKI are two mainstream research websites with insufficient references. Hence, it is advised that researchers gather data from databases to increase the scope and depth of the study, besides the WoS and CNKI, two mainstream researching websites, which cannot contain enough references. Scholars can obtain more in-depth and valuable research by comparing the data to find commonalities and differences. Furthermore, there is a limited number of studies of analytical CRM using a systematic review in China. Thus, researchers can employ this research methodology to analyze analytical CRM. Therefore, there is still much space for research on analytical CRM, and to expand the field, researchers must employ a variety of paradigms, techniques, and viewpoints to define and quantify analytical CRM. Finally, future research could explore the total aspects of CRM, not just analytical CRM. In this digital economy era, CRM, one of the most essential systems for maintaining customers, plays a significant role in maintaining strategic competitiveness. Consequently, each CRM segment should be explored properly for business development.

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