

Bibliometric analysis on e-commerce research in china during 1999-2017 based on projects supported by national social science foundation of china

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Abstract. The fast growth of electronic commerce activities in China during the last two decades has attracted significant attention from academics in different fields. Minimal research have been done to explore the hot spots of e-commerce research in China. This paper analyzes projects on e-commerce financed by National Social Science foundation of China from 1999 to 2017 and draws the basic outline of the research and development of e-commerce in China. It is found that the amount of approved projects per year on e-commerce has shown a rising tendency since 2014, and research hot spots focus on six aspects: consumer behavior under internet environment, trust and credit issues under internet environment, internet business model innovation, development of rural electronic commerce, Internet financial regulation and macro issues related to e-commerce.

Key words. E-commerce, research hot spot, bibliometric analysis.

1. Introduction

With the development of the Internet, the e-commerce market in China keeps growing in size and the business model of e-commerce innovates one after another. E-commerce has become the new engine of economic growth. By June of 2017, the number of internet users in China has reached 751 million which accounted for 54.3% of the total population (CNNIC, 2017). According to the monitoring data of China e-Business Research Center, the transaction volume of e-commerce in China was 22.97 trillion yuan in 2016, up 25.5% over the same period of the previous year. The rapid development of e-commerce has put forward higher requirements for theoretical and practical research. Wang Yingluo and Wang Jiliang came up with an idea of establishing e-commerce subject in China in 2000. Since then, the

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domestic academic circles have begun to pay more attention to the research of e-commerce. The fast growth of electronic commerce activities in China during the last decades has attracted significant attention from practice as well as academics in different fields.

E-commerce does not have a unified concept, and commercial activities online are generally considered as e-commerce. Wang Yingluo, an academican of the Chinese Academy of Engineering (CAE), proposes that the research directions of e-commerce include the application, technology, support and implementation of e-commerce, the related consumer behavior, the relationship between mobile commerce, e-commerce and environment, and others in 2007. E-commerce is an interdisciplinary science that involves many areas such as management, economics, computer, law, marketing, logistics, etc. It covers a very wide range of research. An analysis of the status quo of domestic e-commerce research and knowledge development in this area is of great significance. However, at present, the review of e-commerce research is mostly based on the journal papers as research samples. For example, Pan Hongchun and Shao Bingjia analyzed the content of e-commerce academic papers published in CSSCI journals in 2003-2008. At this stage, the research hot spots in e-commerce mainly focus on enterprise e-commerce strategy and e-commerce environment, etc. Zhang Xiujie takes the Chinese core journal articles as a sample and analyzes the research situation and hot spots of logistics, mobile commerce, payment and security, small and medium-sized enterprises (SMEs), and recommendation systems for nearly 20 years in China.

Many studies have used bibliometric method to examine the research trend of electronic commerce in China and worldwide based on papers published in journals. Ngai & Wat(2002) calssified e-commerce research into four ares including application areas, technological issues, support and implementation, and others based on 275 journal articles published between 1993 and 1999 in nine journals related on EC research. Chen & Wang(2010) conducted a literature review and classification for electronic commerce research based on 4,948 articles listed in the Science Citation Index Expanded (SCIE) and 2,875 articles in the Social Science Citation Index (SSCI) published from 1999 to 2008. Akter & Wamba(2016) explored big data analytics in e-commerce by drawing on a systematic review of the literature. Minimal research have been done to explore the hot spots of e-commerce research in China based on the research program financed by National Social Science Foundation of China(NSSFC).

Some researchers have used the NSSFC Project to analyze the research topics in fields such as Library and Information Science, Sociology and Journalism. At present, the analysis of research programs in e-commerce of NSSFC using bibliometric method is still very small. The National Social Science Foundation of China is the highest level of humanities and social science projects, reflecting the level of development of disciplines, and is the benchmark to carry out research in a field. Based on the information measurement and social network analysis of related research projects of the National Social Science foundation in the field of e-commerce from 1999 to 2017, the article makes a quantitative research and systematic review on the domestic e-commerce development path and research hot spots. First of all,

based on bibliometrics, an in-depth analysis is made on e-commerce projects from the number of research projects, subject distribution, project categories, research institutions and geographical distribution to reveal the development characteristics and laws of the field; second, word frequency analysis, social network and semantic network analysis methods are used to analyze the e-commerce projects and summarize the main research topics and hot spots in the field of e-commerce to present the status quo, characteristics and development trend of e-commerce research.

2. Data Sources and Research Methods

The data in this paper come from the project database query system of the National Planning Office for Philosophy and Social Sciences (NPOPSS). In order to ensure the integrity of the information and no omission of important items, the concept of e-commerce in a broad sense is adopted in this study, keywords such as "e-commerce", "ec", "online shopping", "O2O", "B2B", "online trading", "mobile commerce", "network marketing", "Internet", "network", and "online" are searched, artificial screening method is used to exclude duplicate items and items that are obviously unrelated to e-commerce, and 170 items are obtained. The project year is from 1999 to 2017.

In this paper, the basic data is first sorted by Excel 2007, and then the statistical software SPSS 20.0 is used to carry out descriptive statistical analysis on the variables such as project category, subject classification, project manager information and unit category. Finally, ROST News Analysis Tool 4.5 software developed by professor Shen Yang of Tsinghua University to build social networks, and then carry out word frequency analysis and semantic network analysis of the research topics.

3. Bibliometric Analysis of E-commerce Research in China

3.1. Annual Number of Projects and Trend Analysis

In the field of e-commerce, since Fudan University Professor Zhang Naigen received the "National Protection of Intellectual Property Rights for E-commerce" of the first National Social Science foundation project in e-commerce in 1999, a total of 170 national social science foundation projects have been approved in this field by 2017. Number and trend are shown in Figure 1. As can be seen from Figure 1, the number of e-commerce projects was single-digit in 2009 and before, began to increase in 2010, and reached to 8 in 2013. It has showed a growth spurt since 2014 with the number of projects of 24 in 2014, 31 in 2015, 39 in 2016 and 36 in 2017. Based on this, we divide the domestic e-commerce research into three phases: 1998-2009 as a starting phase, 2010-2013 as a development phase and 2014-present as a mature phase.

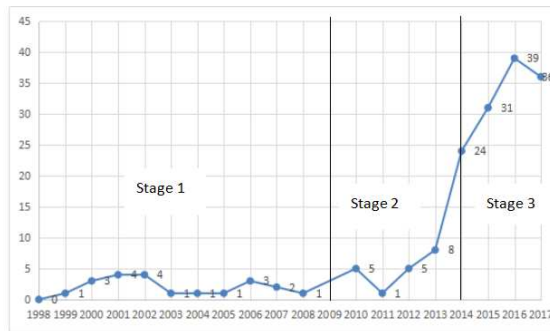


Fig. 1. Number and trend of the nssfc e-commerce projects in 1999-2017

3.2. Analysis of Project Category

E-commerce projects of NSSFC are mainly general projects, the number of which is 103, accounting for 60.6% of total, followed by youth projects, the number of which is 42, accounting for 24.7%. With the application of e-commerce both in depth and breadth, the importance of e-commerce theory research has become increasingly prominent. Since 2014, key projects and major projects have started to take shape in the field of e-commerce. There are 4 major projects and 10 key projects. Among the 4 major projects, three are in Internet finance and 1 is in cross-border e-commerce.

3.3. Subject Distribution

E-commerce is a typical interdisciplinary science that attracts the attention of researchers in different disciplines. The project approval involves 10 disciplines including management science, applied economics, law, theoretical economics, library, literature and information science, sociology, statistics, sports science and journalism, as shown in figure 2. Among them, management science has the highest number of projects, reaching 62, followed by applied economics, reaching 52, the third is law, reaching 21, the fourth is theoretical economy, reaching 10, and the fifth is library and information science, with the project number of 8. The above results show that management science and applied economics are the main force in the field of e-commerce research, e-commerce-related management issues and economic issues are the main direction of academic research, and secondly, e-commerce related legal issues, information dissemination and service and other issues are also hotspots of research direction.

3.4. Analysis of Geographical and Research Institutions Distribution

The organization of the subject responsible person and regional distribution are an important basis for examining the status quo of the research team in this field and the rationality of the project layout. Statistics show that the organization distribution of researchers in e-commerce is very large, involving 121 research institutions,

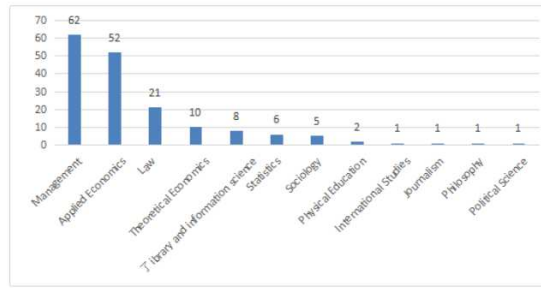


Fig. 2. Disciplinary distribution of nssfc e-commerce research

which are scattered. This shows that e-commerce research has become a commonly studied research field and has attracted the attention of different research institutes. Xi'an Jiaotong University has 6 research projects, indicating that Xi'an Jiaotong University has strong scientific research strength in the field of e-commerce. Zhejiang Gongshang University has 6 research projects. Jiangxi University of Finance and Economics has 4 projects, ranking the third. Central University of Finance and Economics, Zhejiang University, Nanjing University of Finance and Economics, Nanjing Audit University, Hebei University of Technology and Jiangsu University have 6 approved projects. 25 colleges and universities such as Sun Yat-sen University, Renmin University of China and Fudan University each have two projects, the other 86 colleges and universities each have 1 approved project.

Table 1. Geographical Distribution of NSSFC E-commerce Projects

Provinces	No.	Percent	Provinces	No.	Percent
Beijing	23	13.6	Shandong	6	3.5
Jiangsu	18	10.6	Anhui	5	2.9
Zhejiang	13	7.6	Liaoning	5	2.9
Hubei	11	6.5	Tianjin	5	2.9
Shanghai	11	6.5	Fujian	4	2.4
Shaanxi	10	5.9	Guangxi	4	2.4
Guangdong	8	4.7	Gansu	1	0.6
Henan	8	4.7	Guizhou	1	0.6
Sichuan	7	4.1	Hainan	1	0.6
Chongqing	7	4.1	Heilongjiang	1	0.6
Hebei	6	3.5	Shanxi	1	0.6
Hunan	6	3.5	Xinjiang	1	0.6
Jiangxi	6	3.5	Yunnan	1	0.6

In addition, according to the provinces to which the project approval organization belongs, e-commerce related research projects are distributed in 24 provinces in China. As shown in Table 1, Beijing ranks first with 23 projects, followed by Jiangsu with 18 projects, Zhejiang has 13 projects, Shanghai and Hubei Province each have 11 projects, Shaanxi 10, Henan and Guangdong each 8, Sichuan Province and Chongqing each 7, Hebei Province, Hunan Province, Jiangxi Province and Shandong Province each 6, Anhui, Liaoning Province and Tianjin each 5, Fujian and Guangxi each 4, and the other seven provinces each 1.

4. Analysis of Hot Topics in E-commerce Research in China

ROST new Analysis Tools 4.5 developed by Tsinghua University is used to analyze topics of national social science foundation projects in e-commerce related fields, and the research themes and hotspots are found through word frequency analysis and building social network maps.

4.1. Analysis of High Frequency Words and Social Network and Semantic Network

The project name will be collated and summarized in the txt text file, and the ROST NAT software will be used to perform word frequency statistics. After filtering meaningless words, the research sample is obtained and the high frequency keywords that appear in the research topic are obtained. The high frequency words are classified in an artificial way, and shown in Table 2. Basic keywords such as e-commerce, Internet, mobile e-commerce appear most frequently.

In recent ten years, the business model of e-commerce in China has been actively engaged in innovation and the related research has been very active. Among them, the model innovation, O2O, sharing economy and cross-border e-commerce appear more frequently.

In terms of consumer behavior research under the Internet environment, user behavior, Internet word of mouth, online comment and adoption behavior also appear more frequently in the field.

In terms of trust and credit issues under the Internet environment, the relevant terms of trust, credit risk and creditworthiness appear 16 times.

The words related to rural e-commerce such as rural areas, agricultural products and rural households appear 16 times, indicating that rural e-commerce is also a field where scholars study more.

In areas related to Internet finance such as finance and borrowing, the cumulative frequency of occurrences hit 32, indicating that Internet finance is a hotspot of research.

The rapid development of e-commerce has also brought about many social problems. The macroeconomic issues related to e-commerce regulation, taxation, laws and policies are also hot research areas.

It can be roughly speculated that the hot topics in the field of e-commerce research include e-commerce business model, consumer behavior under the Internet

environment, Internet finance, trust and credit issues, rural e-commerce, e-commerce related macro issues from the word frequency. A further analysis is conducted through the social network and semantic network.

Social network and semantic network analysis" function of Rost NAT software is used, after importing the foundation title and clicking the "quick analysis" button, the social network diagram of the e-commerce research topic in the National Social Science foundation Project is obtained."e-commerce", "rural areas", "social contact", "consumer", "consumption", "behavior", "mode", "regulation", "influence" and "Internet"are key nodes in the social network. Research topics include consumer behavior, business model, rural e-commerce, and Internet finance, etc.

Table 2. Research Themes and Word Frequency Analysis

Category	Typical words and frequency	Accumulative word frequency
Basic keywords	E-commerce (42), Internet (41), Mobile (11), On line (10), Online (6)	110
E-commerce business model	Model (23), Business model (8), Model innovation (7), Cross-border (7), O2O (6), Sharing economy (5), Sharing economy (3), P2P (3), E-commerce platform (2), B2B (1), C2B (1), Social Networking (4), Community (3), Medical Services (2), Fresh Food (2), Retail (2), E-shop (1)	80
Consumer Behavior under the Internet environment	Consumer (10), User (6), Customer (4), Consumption (6), Behavior (8), Word of Mouth (5), Adoption (3), Comments (2)	44
Internet finance	Finance (26), Lending (6)	32
Trust and credit under the Internet environment	Trust (7), Credit (1), Credit Risk (3), Integrity (3), Credit (1), Fraud (1), Counterfeits (1)	16
Rural e-commerce	Rural Areas (7), Agricultural Products (5), Farmers (3), Agriculture (1), Industries involving agriculture (1)	16
E-commerce-related macro issues	Supervision (10), Governance (9), Regulation (8), Law (5), Legislation (3), System (4), Policy (4), Guidance (3), Government (3), Taxation (2)	51

4.2. Analysis of Main Research Hotspots

Based on the above analysis, combined with the analysis of the approved projects, it is found that the hotspots and key issues in the field of e-commerce mainly focus on the following aspects:

(1) Consumer behavior research under the Internet environment

Consumption, consumer and consumer behavior are the three high-frequency words appear in the topic of approved projects, indicating that consumer behavior research under the Internet environment is a hot topic in the field of e-commerce. Consumer behavior under the Internet environment mainly studies various consumer psychology and consumer behavior of different consumers in the Internet environment such as online shopping, mobile internet, big data and social commerce, and analyzes various factors affecting consumer psychology and consumer behavior to reveal change rule of consumer behavior. For example, "The Impact Mechanism of Online Retailers' False Failure Return Policy on Consumer Behavior" initiated in 2014, "The Impact of Cyber Fictional Characters on Consumer Behavior in the Context of Big Data" initiated in 2015, and "Research on Behavior Patterns of Online Shopping Based on Semantic Mining in the Context of Big Data" are all such topics.

(2) Research on trust and credit issues under the internet environment

The virtuality of Internet and regulatory difficulties make the trust issues very prominent and important in e-commerce. Trust and credit issues in the Internet environment have also become academic research hotspots in e-commerce. The booming e-commerce results in online fake products, Internet fraud, telecommunications fraud and privacy information disclosure. According to the monitoring results of the 360 Security Center in 2016, 70.5% of Internet users had suffered from network security incidents. Among them, online fraud is the primary network security problem encountered by Internet users.

(3) Research on the Development of Rural E-commerce

The popularity of smart phones makes the proportion and size of rural netizens increasing, which further drive the development of rural e-commerce consumer market. As early as 2013, e-commerce enterprises such as JD.com, Alibaba and Suning launched "going rural" strategies. The development of rural e-commerce is becoming a new impetus for governments and e-commerce enterprises to seek new development and transformation. In November 2015, the General Office of the State Council issued the Guiding Opinions on Accelerating the Development of E-commerce in Rural Areas, and comprehensively deployed and guided the healthy and rapid development of rural e-commerce. Against such background, the development model of rural e-commerce has also become a hot topic of study. After statistics, 10 projects have been set up in the National Social Science foundation for rural e-commerce since 2014. For example, "Research on Coordination Development Mechanism and Route Selection of Agriculture-related E-commerce and Rural Regional Economy", "Research on Model Innovation and Route Selection of Fostering Rural E-commerce Industrial Clusters in China", "Research on the Integrative Development of China's Fresh Agricultural Product E-commerce and Traditional Circulation System" initiated in 2015 and project "Study on Spatial Spread Effect of Rural E-commerce Industrial Cluster under the Internet Plus" in 2016 are all such topics.

(4) Business Model and Innovation Research under the Internet Environment

Model and business model are high-frequency words of approved projects. The popularization and infiltration of mobile Internet not only bring about changes in

consumer behavior patterns and consumption patterns, but also promote the innovation of business models. The faultiness of China's traditional business system and dividend brought by mobile Internet users have promoted the innovation of China's Internet business model. The project of "Innovative Research on Platform-based Business Models based on Internet" initiated in 2015, "Research on the Influencing Factors and Innovative Paths of Internet Platform-based Business Model Innovation from the Perspective of Value Creation" and "Research on Poverty Alleviation through E-commerce and Innovation of Business Model under New Regulation Economics" in 2016 are all such topics.

(5) Research on Internet finance and its regulation

The rapid development of Internet finance has become an important phenomenon attracting much attention in e-commerce and China's financial field in recent years. Internet finance has also become a hot spot in academic research in e-commerce and finance. In the past three years, the projects approved by the National Social Science foundation about Internet finance hit 24. The research topics mainly focus on the risk prevention, governance and supervision of Internet finance.

(6) E-commerce-related laws, regulatory and other macro issues

China has become the largest e-commerce market in the world, but the problems such as the stagnation of legislation and ineffective supervision make the development of e-commerce more difficult. How to supervise and manage e-commerce and various new models, whether levy taxes on e-commerce, and the legal issues related to e-commerce have also become hot research areas.

5. Conclusions

This paper analyzes projects on e-commerce financed by National Social Science foundation of China from 1999 to 2017 and draws the basic outline of the research and development of e-commerce in China. Research projects on e-commerce foundationed by the National Social Science foundation have showed a growth spurt since 2014. As a typical interdisciplinary field, e-commerce has attracted the attention of different types of colleges and researchers in different disciplines. Management science and applied economics are the main subjects of e-commerce research. Xi'an Jiaotong University and Zhejiang Gongshang University have strong scientific research strength in the field of e-commerce. "E-commerce", "Internet", "finance", "model", "mechanism", "impact", "innovation", "enterprise", and "mobile" are the high-frequency words in e-commerce research. "E-Commerce", "rural", "social contact", "consumer", "consumption", "behavior", "patterns", "regulation", "impact" and "Internet" are the key nodes in e-commerce social networks. In recent years, research hot spots in China mainly focus on six aspects: e-commerce business model, consumer behavior under Internet environment, Internet finance, trust and credit issues under Internet environment, rural e-commerce and macro issues related to e-commerce.

The main limitation of this study is that only NSSFC projects are included for bibliometric analysis. Comparative analysis between NSSFC projects and papers on e-commerce published in journals would offer more information on the research hot

spots and trend of e-commerce in China in the future study.

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