

Construction of Cities' E-Commerce Competitiveness BRMS Model from the System Perspective

Shi Yin^{1,2*}

¹Shanghai Innovation Center of Reverse Logistics and Supply Chain, Shanghai Polytechnic University, Shanghai City 201209, China

²School of Economics and Management, Shanghai Polytechnic University, Shanghai City 201209, China

*Corresponding Author.

Abstract:

E-commerce in China presents a spurt of development, and its proportion of GDP is increasing, e-commerce has become an important part of urban economy. E-commerce promotes the development of cities by stimulating consumption, promoting trade, promoting the transformation and upgrading of traditional industries, promoting the development of modern service industry, promoting the focus of human resources and promoting the upgrading of government services, and improving the competitiveness of cities has attracted more and more attention from the theoretical circle. This paper take e-commerce demonstration cities in China as the research object, and constructs a theoretical model of urban e-commerce competitiveness by studying the internal formation mechanism and construction promotion mechanism of urban e-commerce. Based on the theory of industrial agglomeration and system science, this paper analyzes the competitive factors of urban e-commerce. This paper finds that the urban e-commerce system is manifested as four subsystems: basic environment of e-commerce, industrial agglomeration, market expansion and sustainable development. Among the BRMS model elements of urban e-commerce, the effect of basic environment on e-commerce is lagging behind, and industrial agglomeration makes the city's competitive advantage more significant. Urban industrial cluster is the endogenous power source to improve the competition level of urban e-commerce enterprises. Only by continuous innovation and development can the city maintain its competitiveness. The research has enriched the theoretical results of urban e-commerce competitiveness. Only by enriching the samples outside the demonstration cities, can the dynamic, relative and comprehensive characteristics of e-commerce competitiveness be further suggested and the results be more influential.

Keywords: *E-commerce competitiveness, BRMS model, Factor analysis.*

I. INTRODUCTION

As main social contradictions in China have changed, how to cross the pass of moderately developed countries and improve the quality of economic development from a higher level has become a problem to

be solved in building a modern economic system. E-commerce competitiveness is the reflection of a city's resource structure or market environment and it indicates the adjustment capability of the city. The content of comparison is the advantage of e-commerce competition and the essence is the comparison of productivity.

As the leading representative of the strategic emerging industry and internet industry, e-commerce has become an important component of the urban economy and the necessary approach in promoting urban development and upgrading the comprehensive strength of the city. E-commerce, therefore, has become an important indicator of city competitiveness [1].

II. CURRENT RESEARCH STATUS

The researchers are paying increasingly more attention to the study on the competitiveness of e-commerce. From the perspective of the operation of e-commerce enterprises, some scholars believe that interpreted the core competitiveness of e-commerce enterprises as the ability to realize the richness of information and big audience and to define competitors and competition approach in accordance with the new environment. Some experts believe that constructed the e-commerce evaluation model for Chinese cities from the aspect of e-commerce's influences on the development of the economy and society and proposed to boost the urbanization process comprehensively by e-commerce. Through circulation e-commerce competition study that major influential factors for urban commerce circulation e-commerce competitiveness mainly include capital input and labor input. On the basis of the "diamond model", some scholars have proposed that essential production factors, demand conditions, relevant supporting industries, enterprise strategy and horizontal competition, government and opportunities, and found that the lack of innovative and compound talents is the bottleneck for the e-commerce development [2]. Besides, specific measures including creating an environment for innovation and business start-up, accelerating the cultivation of e-commerce high-level talents and improving e-commerce laws and regulations.

To sum up, the study on the development mechanism of the city's e-commerce competitiveness is still in the start-up phase. Most scholars only study the development mechanism of e-commerce competitiveness from the perspective of industry focus. For instance, the development mechanism of e-commerce competitiveness in the service industry from the self-organization development process in the e-commerce service industry nesting zone; the realization mechanism of the adaptive ability of the e-commerce service industry with PLS partial least squares modeling method, which laid a certain foundation for this research.

III. SYSTEM PERSPECTIVE IS REQUIRED FOR THE STUDY ON THE CITY'S E-COMMERCE COMPETITIVENESS

The development and evolution of urban e-commerce feature complexity, self-organization and openness, which enables the e-commerce system to change in function, elements and structure while

maintaining its integrity. Over the process of e-commerce development in cities, there will be phenomena of expansion, agglomeration and upgrading. On one hand, it is manifested as the quantitative growth, which means the scale and profit of the e-commerce industry are developed through the input of various elements; on the other hand, the development of e-commerce in cities is presented as qualitative development, i.e, upgrading the industrial structure and promoting new economic growth through e-commerce [3]. The joint action and development of these two growth modes make the system promote the e-commerce function of the city in an emerging way, and facilitate the e-commerce to grow and develop in a nonlinear and self-organizing way.

IV. WORKING MECHANISM OF CONVERTING E-COMMERCE TO THE CITY'S COMPETITIVENESS

4.1 Analysis of the Mechanism of E-commerce's Influences on City Development

The city is the gathering place of various human social activities. It is a social economy with complex and diverse elements, structures, layers and functions. The impact of e-commerce on city development is mainly presented in aspects of economic growth, economic structure optimization and governance.

4.1.1 Promote the transformation of the city's economic growth mode

The appearance of an emerging market breaks the transaction mode in the traditional market. To adapt to the development of the emerging market, traditional industries shall change or transform the industry. The mode of urban economic growth will change from extensive development to intensive development, which would urge the city to re-adjust the industrial structure. The city would transform from an industrial manufacturing center and trade center into an information center and information management and service center. Meanwhile, the development of e-commerce would give better play to the role of the market in making the basic allocation of urban resources, promote the flow of commodities and various production and living factors, weaken the constraints of the traditional market, reduce transaction costs, facilitate the combination of the Internet market and the traditional market, and thus enable the economic growth mode of the city experience a fundamental change.

Hangzhou is one of the cities with an early start and rapid development of e-commerce in China, one of the first e-commerce demonstration cities and national informatization pilot cities, hosting e-commerce comprehensive service enterprise groups like Alibaba and a group of professional e-commerce enterprises growing rapidly. Within no more than 25 years from 1996 to 2021, the internet industry boosted the rapid growth of Hangzhou's economy and made it be ranked in the first-tier cities of China and one of the most competitive cities in the world.

4.1.2 The influences of e-commerce on the international trade of the city

E-commerce on one hand brings opportunities to the development of the city, on the other hand, generates new challenges for cities to occupy active positions in the global resource allocation. E-commerce removes the limitation suffered by traditional trade in space and time as well as the regional limitation for consumers and manufacturers, exerts a great impact on the trade market, trade subjects, trade products, trade methods, trade costs and trade policies (see Figure 1) through the optimization of global trade resource application and provides a broader global trade market for cities.

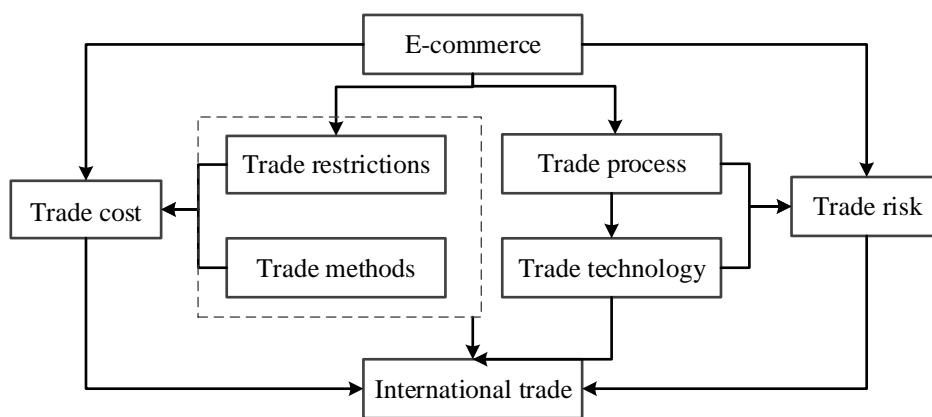


Fig 1: Diagram of the mechanism of e-commerce and international trade

4.1.3 E-commerce's influences on enterprises' competition in cities

Enterprise competition is the comprehensive competition combining resources and capability. Internet breaks the spatio-temporal limits and reduces information asymmetry. It provides enterprises with more commercial opportunities and reduces the product cost and transaction cost significantly through network terminal and agile manufacturing. In this way, the competition among enterprises is becoming fairer. Besides, as e-commerce could provide enterprises with more accurate information, it lowers the investment risk of enterprises greatly.

4.1.4 E-commerce's influences on city management

The popularization and development of e-commerce also affect the government's way of acting profoundly. In the face of the changes resulting from the internet in terms of urban politics, economy, ideology and transaction technology, the government shall improve the capability to utilize modern information technology, transform service mode and philosophy, revise traditional legal regulations, provide more convenient service to the market and prevent the weakening and failure of the government's regulatory power on the market.

As an emerging development mode, e-commerce's influences on urban management have far exceeded e-commerce itself. It has to realize the role of the internet in national management and social governance, accelerate information development of internet and the development of the new-type smart city, speed up to improve social governance capability and standard with internet information technology, develop a strong nation of internet and comprehensively and profoundly recognize e-commerce's influences on urban management.

4.1.5 Demonstration of e-commerce on urban development

Modern economic theory originated from the neoclassical economic growth model of Solow and Swan, mainly used to explain the relationship between savings, capital and economic growth [4]. Based on Solow model, MRW framework deduces convergence conditions of economic growth, which improves a better starting point for empirical research [5]. Assume that the total production function of the city is:

$$Y_t = K_t^\alpha H_t^\phi (A_t L_t)^{1-\alpha-\phi} \quad (1)$$

Where, L represents labor supply with A as technical efficiency index, parameters α and ϕ are output elasticity of material capital and human capital respectively, K is total capital stock, H is human capital stock, and the dynamic change process of material K and human capital H is:

$$\dot{K} = s_k Y_t - \delta K_t, \quad \dot{H} = s_h Y_t - \delta H_t \quad (2)$$

Where s_k and s_h are respectively the savings rate of physical capital and the investment rate of human capital, and the depreciation rate is δ . Assuming that the stable level of per capita income is y^* , the convergence rate at time t is:

$$\gamma_y = \frac{d[\ln y]}{dt} = \lambda [\ln(y^*) - \ln(y_t^*)], \quad \lambda = (n+g+\delta)(1-\alpha-\phi) \quad (3)$$

Where λ is the convergence parameter, $n+g+\delta$ is the sum of labor rate growth rate, material depreciation rate and technological progress rate. Solve the above equation and substitute the initial effective per capita y_0 into, then:

$$\ln(y_t) - \ln(y_0) = (1 - e^{-\lambda t}) \ln(y^*) - (1 - e^{-\lambda t}) \ln(y_0) \quad (4)$$

Substitute the expression of model equilibrium value y^* into Formula (4), and the per capita income growth rate equation can be obtained:

$$\gamma_y = (1-e^{-\lambda t}) \ln(y_0) + (1-e^{-\lambda t}) \frac{\alpha}{1-\alpha-\phi} \ln s_k + (1-e^{-\lambda t}) \frac{\phi}{1-\alpha-\phi} \ln s_h - (1-e^{-\lambda t}) \frac{\alpha+\phi}{1-\alpha-\phi} \ln(n+g+\delta) \tag{5}$$

The convergence of urban economic growth is evaluated based on MRW framework. Equation (5) is written in the form of regression equation:

$$\gamma_{iy} = \beta \ln(y_{0i}) + \psi X_i + \pi Z_i + \varepsilon_i \tag{6}$$

Where, $\beta = -(1-e^{-\lambda t})$, X_i is vector group, and $X_i = \{x_{i1}, x_{i2}, \dots\}$ includes the natural logarithm of the physical capital saving rate s_k , the natural logarithm of the human capital investment rate s_h , and $\ln(n_i + g + \delta)$ related to technology, population and other factors, which are the "core variables" in the model. Obviously the coefficient β should be negative, so this convergence is called β convergence.

Cross-section regression method is applied to study the electronic commerce to the urban economic growth convergence test, observe heterogeneity for city should not lead to $\hat{\beta}$ estimate on the high side, but based on this article only consider whether has a promoting effect to the urban development, e-commerce application MRW model on urban economic growth convergence test is reasonable. Drawing on the research of domestic and foreign scholars, this paper chooses the common index per capita GDP to investigate the role of e-commerce in urban development. To this end, e-commerce elements are added into the modern economic growth framework, and the model is designed as follows:

$$\gamma_{iy} = \alpha + \beta_1 \ln(ECgmv_i) + \beta_2 \ln(net_i) + \beta_3 \ln(IAI_i) + \beta_4 \ln(rot_i) + \beta_5 \ln(INV_i) + \varepsilon_i \tag{7}$$

Seventy national e-commerce demonstration cities in the first batch, the second batch and the third batch were selected as samples, and the cross-sectional data were the sample values of each city in 2020. The explained variable γ used in this paper is per capita GDP, and the explanatory variables include:

- (1) The natural logarithm of e-commerce transaction volume, $\ln(ECgmv_i)$;
- (2) The natural logarithm of Internet penetration rate, $\ln(net_i)$;
- (3) The natural logarithm of the average income of e-commerce industry, $\ln(IAI_i)$;
- (4) Natural logarithm of talent pool, $\ln(rot_i)$;

(5) Investment level of tertiary industry, $\ln(INV_i)$.

Table I shows the analysis results of the impact of e-commerce on urban economic development based on the transaction volume of e-commerce.

TABLE I: Analysis of the influence of electronic commerce on urban economic development.

$\ln(ECgmV_i)$	$\ln(net_i)$	$\ln(IAI_i)$	$\ln(rot_i)$	$\ln(INV_i)$	Constant term	City numbers	<i>R</i> -Squared
0.028*** (0.079)	0.685** (0.236)	0.514*** (0.135)	-0.071 (0.111)	0.376* (0.223)	2.325* (1.213)	53	0.743

Note: Brackets are standard error, ***<0.01, **<0.05, *<0.1.

As can be seen from Table I, high value of R^2 indicates a good model fitting, that is, GDP per capita in the model can be explained by variables such as e-commerce transaction volume. The effect regression $\ln(ECgmV)$ value of β is 0.028, the effect regression $\ln(net)$ value of β is 0.685, and the effect regression $\ln(IAI)$ value of β is 0.514. The convergence of β is very significant. At the same time, the investment level of the tertiary industry $\ln(INV)$ still makes a significant contribution to economic growth, which also fully verifies the important role of investment as driving economic development. However, the regression value β of the effect of e-commerce talent reserve is only -0.071, indicating that in China's industrial transformation and upgrading, the transformation of economic growth model, innovation driving and leading is still a very urgent topic. The influence of e-commerce on economic growth still has a lot of room to improve.

Combined with the above research, it can be found that the tertiary industry investment, talent reserve and e-commerce have a positive impact on the promotion of urban economic development, e-commerce can make the city develop faster at the original level of development, e-commerce has become a new growth point and engine to promote China's urban economic development. In the process of urban development, it is necessary to further enhance the importance of e-commerce to promote e-commerce to lead the urban economy out of a good and fast development of the new road in the context of the slow recovery of the world economy.

4.2 Analysis of City's Guiding Function for E-commerce

In accordance with the urban industry agglomeration theory and e-commerce's reliance on urban functions, the guiding role of cities on e-commerce is mainly reflected in the following aspects (see Figure 2).

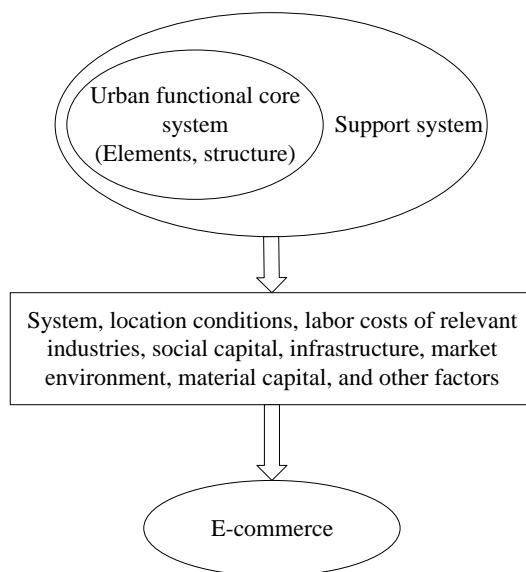


Fig 2: The dependence of e-commerce on urban functions

Firstly, cities create a sound development environment for the development of e-commerce with its outstanding industrial support (economic environment). For instance, Shenzhen, as the first national e-commerce demonstration city in China, has over 120 industrial parks and the application rate of e-commerce in traditional enterprises exceed 90%. With its e-commerce listed in the first rank of China, Shenzhen realized the e-commerce trading volume of RMB3318.6 billion or 8.7% of the e-commerce trading volume nationwide in 2019, among which the trading volume of physical commodities accounts for 74.98%; online retail volume rose to RMB907.61 billion, with the growth rate being up to 35.2%; online retail sales took 32.8% of the total e-commerce trading volume of the city.

Secondly, the city promotes the extensive application of e-commerce with its comprehensive and efficient element gathering and distribution function (economic environment). E-commerce at the very beginning was developed in the region with a sound information foundation and developed economy. The city itself has been equipped with sound functions, which lays a solid foundation for the development and 'infiltration' of e-commerce. In accordance with the document's summary of e-commerce demonstration city development experience, during the "13th five-year plan" period, 70 e-commerce demonstration cities in China have formulated medium and long-term development plans for e-commerce. More than 80% of traditional enterprises and over 95% of large-sized enterprises have applied the internet platform to carry out business activities. E-commerce has been widely used in all fields of urban society and is deeply integrated with the real economy.

Thirdly, the city upgrades the e-commerce application standard with independent innovation capability (trading technology). The core of e-commerce is innovation and the city is the social environment where innovation is most likely to be born. 70 e-commerce demonstration cities in China are mainly large and

medium-sized cities and coastal cities. These cities occupy a large proportion and play a leading role in the development of e-commerce in China. Large and medium-sized cities and coastal cities do not only gather a large batch of innovative talents, but also have the characteristics to lead technological innovation.

Fourthly, cities drive the rapid development of e-commerce with advanced culture (politics and ideology). China's e-commerce has developed rapidly in the form of a strong new economy for more than 20 years. It is a new choice for the market when the traditional market is slightly slacked under the background of economic globalization. E-commerce is a 'new' industry that tends to germinate and develop in cities with innovative ideologies.

4.3 Analysis on the Evolution of E-commerce Competitiveness

The development process of e-commerce competitiveness is a process of rapid development of information technology and information industry, as well as a process of e-commerce demonstration cities and demonstration parks leading the development of urban industries and enhancing urban competitiveness.

In just over two decades, e-commerce has penetrated all areas of China's economy and society in an all-around way. China's e-commerce share in 2021 is far higher than the 15% in the US, and above its nearest competitors, South Korea and the UK, which account for less than 30%. In the same year, e-commerce will account for 52.1% of China's retail sales, up from 44.8% in 2020, effectively ensuring the realization of the national economic growth target. E-commerce, as an important factor affecting urban competitiveness, improves urban competitiveness in a sustainable and comprehensive way by developing the Internet market and advancing the integration of the physical market and the Internet market. To truly make urban e-commerce competitiveness become a key part of urban competitiveness, the following transformation needs to be completed:

4.3.1 E-commerce has become one of the leading industries in the city

The industrial structure is a basic feature of a city's economy, and it also reflects a city's position in the world market. Especially on the premise that the physical market and the Internet market have been formed, the scale and output value of the Internet market to a certain extent determine the economic growth of a city and also play a vital role in improving the notability of a city. For example, as e-commerce has become one of the most important leading industries in Hangzhou, e-commerce and economic growth have always been ranked at the forefront of the country and become the focus of the Internet economy attracting worldwide attention.

4.3.2 Massive gathering of human resources

E-commerce, based on the modern information technology that leads the development of the world, drives economic and social transformation and long-term development. It is a strategic emerging industry integrating intensive knowledge and technology, less consumption of material resources, great growth potential, and good comprehensive benefits. Moreover, its development process of talent demand far exceeds that of the general industry. Human capital stock and talent competency play a decisive role in the competitiveness of urban e-commerce [6]. Shenzhen, an e-commerce model city, has attracted a pool of professional information technology talents, technology development talents, e-commerce entrepreneurs and planners through higher labor remuneration than ordinary cities, innovative and entrepreneurial atmosphere, continuous education and training, as well as supportive and thoughtful living arrangements, thus forming a comfortable atmosphere where a pool of talents gather.

4.3.3 A huge influx of venture capital

Under traditional market conditions, savings are the main source of capital, and the savings rate basically determines the scale of investment. In the development environment of emerging markets, capital has become the engine for the rise of new e-commerce models. With the help of the power of venture capital, capital quickly takes over the market by taking advantage of new models, and then adjusts and standardizes the market. Taxi-hailing, food delivery, bike-sharing and online celebrity promotions, which have sprung up in cities in recent years, are powerful signs of investment focus on emerging markets.

4.3.4 Heavy investment in research and development

E-commerce develops rapidly driven by the rapid updating of information technology, which has become one of the most important production factors of e-commerce. Cities with developed e-commerce, such as Shanghai, have always been at the center of advanced polarization in terms of innovation funding, and have become the culmination of R&D funding in the Yangtze River Delta. Hangzhou, another city with high investment in R&D, is at the center of sub-polarization. In terms of enterprise R&D intensity, the top 1/4 cities are mainly cities with developed e-commerce such as Beijing, Shanghai, Guangzhou, Shenzhen and Chengdu. In general, R&D investment has become the main driving power for improving the competitiveness of urban e-commerce.

4.4 Formation Characteristics of E-Commerce Competitiveness

Urban e-commerce competitiveness is the core of urban e-commerce to gain advantages in the global economic integration competition and determines the inherent characteristics of urban e-commerce. Its main characteristics are as follows:

4.4.1 Dynamicity

Urban development is a continuous dynamic process, which is more prominent with the popularization of the Internet and shows a dynamic positive correlation change.

The dynamicity of e-commerce has increased the notability of the city. E-commerce “Internet +” has also given cities more confidence while creating new economic growth points. The comprehensive ranking of cities will change due to the changes brought by the information revolution, and the competitiveness of e-commerce, as an important part of the competitiveness of cities, will also change accordingly. Among the first and second batches of 53 national e-commerce demonstration cities announced, a group of third- and fourth-tier cities stand out in the list, such as Yiwu, Quanzhou, and Taizhou. The third batch of 17 e-commerce demonstration cities announced at the beginning of 2017 is dominated by Northwest, Southwest, and Northeast China. The change breaks the long-standing convention that city size determines the ranking of city competitiveness. E-commerce travels through time, space and region with its dynamicity, enhancing the notability of cities in an all-around way, and profoundly affecting the competitiveness of cities.

4.4.2 Relativity

From a vertical perspective, cities at different stages of development have different levels of e-commerce competitiveness. Cities with a high level of Internet development and application have a high level of urban industry focus effect, and its competitiveness of urban e-commerce is also at a relatively high level. On the contrary, cities with a low level of Internet development and application have a relatively low level of e-commerce competitiveness. To judge the strength of a city, it is necessary to make a horizontal comparison with its competitors. Even though different cities are in the same period, due to the differences in politics, economy, ideology and natural endowment, their e-commerce competitiveness also has certain differences.

In terms of the relativity of urban e-commerce competitiveness, cities with a relatively low level of e-commerce development also have weak urban competitiveness. On the contrary, cities with a high level of competition need to rethink their future development trends and competitive advantages in the Internet era, adapt to the impact of the Internet economy, realize the transformation of urban development strategy, and enter a new period of competitive growth. Take Shanghai as an example. In the 21st century, Shanghai must grasp the opportunities brought by the Internet economy and carry out adjustment and transformation so as to maintain its advantages and become a leading city in the world. Among all the promoting factors, e-commerce is undoubtedly an important one to enhance Shanghai's comprehensive competitiveness. From 2006 to 2020, the global e-commerce transaction scale has grown from \$170 million to \$6.65 billion, and the global e-commerce market scale has continued to grow rapidly. During this period, Shanghai's e-commerce transactions have increased from ¥208.74 billion to ¥3 trillion, with e-commerce transactions (absolute value) accounting for 6.4% of GDP, fully reflecting that e-commerce promotes the sustainable development of the city.

4.4.3 Synthesis

The synthesis of e-commerce improves the utilization rate of urban resources. As an important component part of emerging industries, e-commerce is accelerating the penetration and integration of various industries and fields in the city, and enhancing the competitiveness of cities by improving the efficient utilization of comprehensive resources and the efficient integration of urban elements. The cooperation mechanism required by e-commerce has led to changes in the resource utilization mechanism. Each subject is inclined to select those with high resource utilization through the network for cooperation. Sharing resources and obtaining the greatest common interests have become the key to the success of e-commerce. E-commerce needs to be concentrated in cities for better development. It perfectly integrates scientific and technological innovation with consumer demand, forming e-commerce demonstration cities and demonstration parks to lead the development of urban industries. Especially in the field of sharing economy, the higher the degree of aggregation, the closer the connection, and the higher the probability of cooperation, the higher the utilization rate of urban resource elements [7, 8].

V. THEORETICAL MODEL OF URBAN E-COMMERCE COMPETITIVENESS FROM THE SYSTEM PERSPECTIVE

5.1 Principles of Establishing Urban E-Commerce Competitiveness Model

In order to maintain sustainable competition, cities should make full use of the advantages of urban industrial focus, industrial market expansion and sustainable development. To establish a theoretical model of the urban e-commerce industry, various factors such as the basis of electronic commerce environment support, resource aggregation level, market expansion level and sustainable development level should be considered comprehensively in order to select reasonable and effective evaluation indicators to construct a science evaluation theoretical basis and an index system to highlight the characteristics of the e-commerce industry.

In view of the combination of qualitative and quantitative analysis, the basic guiding ideology of management science is highlighted, and four principles for establishing a theoretical model of urban e-commerce competitiveness are proposed:

(1) Systematic principle. The theoretical model of urban e-commerce competitiveness should first follow the basic principles of the system, and establish the dimensions of urban e-commerce development from the four basic perspectives of elements, structure, environment and function. It should fully reflect e-commerce capabilities and related influential factors, and be able to carry out systematic and hierarchical analysis of each dimension in each subsystem and build a system model.

(2) Completeness principle. Model indicators, as an organic whole, should be able to reflect and measure the competitiveness of urban e-commerce. E-commerce competitiveness is the result of the formation of the dual structure of the market and the result of social and economic development. When

selecting indicators, the conditional indicators should be used as much as possible, and the result indicators and output indicators should be selected.

(3) Practical principle. The model should be of high value for popularization and application. Therefore, the statistical caliber and classification method of the model should be consistent, and the required data should be obtained from official statistical resources as far as possible.

(4) Feasibility principle. The model should fully reflect the characteristics of the industry, and be able to maintain the stability of the model, so as to facilitate the vertical and horizontal comparison of the model. Indicators that are not statistically quantifiable or whose data are not easily available and are not very important can be temporarily excluded from the indicator system.

5.2 Theoretical Model of Urban E-Commerce Competitiveness from the System Perspective

Inspired by the analysis of the e-commerce element model, this paper conducts a block study on the urban e-commerce system from four basic perspectives of element, structure, environment and function, and from the internal structure and system function. The urban e-commerce system is represented as four subsystems of e-commerce basic environment, industrial aggregation, market expansion and sustainable development, and finally coupled into a theoretical model (BRMS model) of urban e-commerce competitiveness from the perspective of the system, as shown in Figure 3.

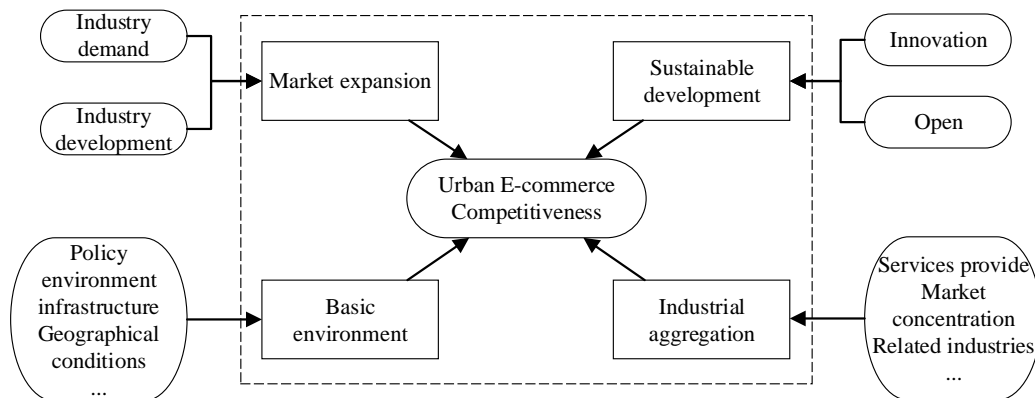


Fig 3: BRMS model of urban e-commerce competitiveness

VI. FACTOR ANALYSIS ON BRMS MODEL OF URBAN E-COMMERCE COMPETITIVENESS

6.1 Analysis on Influence of Basic Environment Support to Urban E-Commerce Competitiveness

In recent years, many scholars have gone one step further to explore quantitative analysis tools and methods on the basis of existing qualitative research results. Based on Michael Porter's Diamond Model,

Canadian scholars Jim Padmore and Hervey Gibson have proposed a new model called GEM Model to analyze industrial competitiveness comprising “Grounding—Enterprises—Markets”. The model considers the factor “resources” and “facilities” offered by the external of industrial clusters to the production process of enterprises within industrial clusters as the basis of “factor pair P”.

International Institute for Management Development (IMD) mentions in its Global Competitiveness Report that not only technology advancements, but also institutions can affect competitiveness. Industrial incentives are indispensable to economic development. As an emerging strategic industry, e-commerce is able to gain sound and sustained development with government “market-friendly” policies that optimize market institutions [9].

E-commerce develops with the advancements of the internet and real-time online trading asks for support of high-speed internet. Therefore, encouraging internet infrastructure construction, enhancing returns on investment and improving the online communication environment have become priorities for facilitating e-commerce development [10].

New spatial economy believes that although we have taken equal distribution among cities in eastern China, central China, western China and northeastern China into consideration when selecting e-commerce demonstration pilots, the first two batches are mainly in Yangtze River Delta and Pearl River Delta regions, suggesting that geological location represents a major factor influencing the competitiveness of urban e-commerce [11].

Based on the above facts, the basic environment support for urban e-commerce enables urban industries to gain sustained and strong competitive edges through policy environment, infrastructure, economic environment and geological location.

The improvement of the e-commerce basic environment can elevate urban e-commerce competitiveness with a multiplier effect, which is mainly shown as its impact on urban employment, production and other economic activities (see Figure 4). The impact will be realized in two ways: first, investing more in e-commerce development; second, the basic environment helps to consolidate the competitiveness of e-commerce with a multiplier effect.

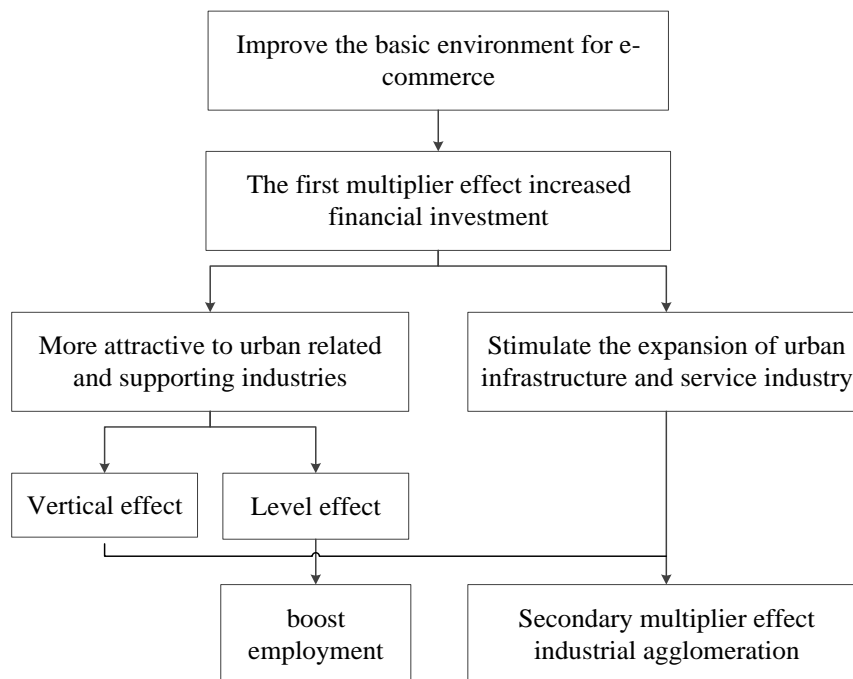


Fig 4: E-commerce basic environment improves the process of multiplier effect operation

As a matter of fact, this multiplier effect demonstrates how the basic environment can make e-commerce stronger. Similarly, it's not hard to imagine the same effect of industrial incentives on e-commerce competitiveness. It has a direct impact on e-commerce business expansion capability via financial support, and thus promoting the upgrading of traditional industries, which finally enhances urban e-commerce competitiveness. On one hand, small investments can only take effect to serve industrial development after a certain period of time; on the other hand, the progress of e-commerce asks for higher requirements for infrastructure such as larger cyberspace and high internet speed. As a result, the improvement of e-commerce basic environment and e-commerce industries usually have delayed pull effect on investments.

6.2 Analysis on Influence of Industrial Clusters to Urban E-Commerce Competitiveness

Industrial Organization Theory believes the market structure interacts with market behaviors and market performance. The theory thinks a centralized market is bound to lead to super-normal profits. As long as the market operates with efficiency, it should be left without additional interventions.

Both enterprises and traditional industries could benefit from e-commerce in innovation, cross-sector integration and industrial agglomeration. The degree that e-commerce resources are concentrated shows how urban e-commerce related industries are concentrated which is composed of market concentration, relevant industries and e-commerce companies' serving competence.

The impact of urban e-commerce industrial clusters on urban competitiveness is shown through collective system effect, innovation effect, pull effect and synergy effect (see Figure 5). Some industries can enhance their competitiveness with the help of other related advanced industries within the cluster, which can in turn effectively promote the growth of the whole enterprise group in the cluster and the competitiveness of e-commerce. Thanks to the externality which is composed of institutional effect, innovation effect, pull effect and synergy effect, the enterprises within the cluster improve the competitiveness of e-commerce clusters with their motivation advantages [12].

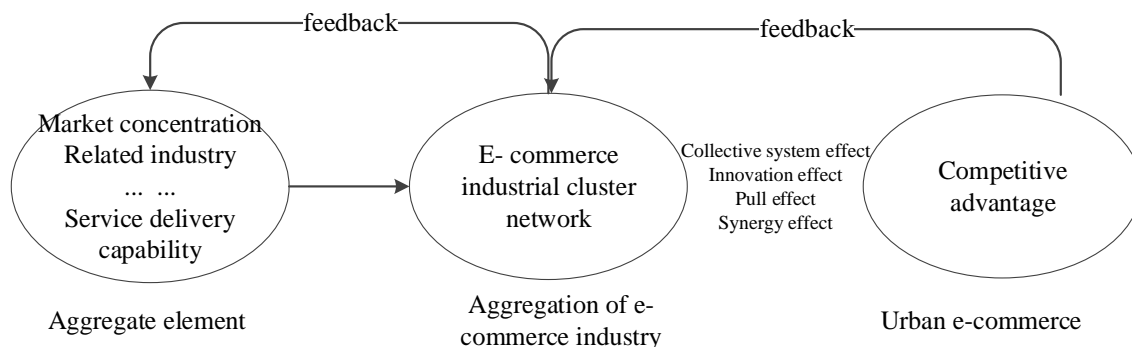


Fig 5: Analysis of the impact of resource aggregation on urban e-commerce competitiveness

In summary, e-commerce resource agglomeration serves as the social root for enterprise resource integration and the environment, making organizational changes and ecological evolution a reality, and achieving systematic symbiosis among enterprises. E-commerce industrial agglomeration makes the competitive advantages of the industry more obvious.

6.3 Analysis on Influence of Market Expansion to Urban E-Commerce Competitiveness

E-commerce market expansion competitiveness is the result of the inward networking and outward rooting of the industrial organization systems. The competitiveness of traditional industries does not involve market expansion. First, it does not base on Porter's Diamond Model which is conducive to enhancing industrial competitiveness, but it is not the external factor to generate industrial competitiveness. Second, the competitiveness is not necessarily from geological advantages as the internet economy has weakened its role. Third, competitiveness is not necessarily from a natural endowment. Although natural endowment is an indispensable factor for the growth of the e-commerce industry, the industry itself is characterized by space-transcending, which has been proven by Yiwu's case (the city has become the national small commodity center). To sum up, e-commerce market expansion is by no means a simple linear relationship, but rather a system jointly influenced by e-commerce enterprises with similarity and complementarity.

When it comes to competition of e-commerce industry in different cities, it's necessary to make differentiation to maintain equilibrium and avoid entire homogeneity. The competitiveness of e-commerce enterprises in different cities depends on the organic driving forces of urban industrial clusters [13].

The dynamic process of market expansion competitiveness of the e-commerce industry is more characterized by compound series connections. The power source sends orders to level 2 induced power (demand module) and level 3 induced power (expansion module), and then continues to induce new power (demand or expansion). In this process, it's possible that the expansion function may degrade to the figure upper part (see Figure 6). From the perspective of gradient dynamics, the model of e-commerce market expansion is as follows: the level 1 power source sends policy orders to trigger the induced power of level 2 which is then transformed into the power source at level 2, and then the level 2 power source sends policy orders to trigger the induced power of level 3 which is then transformed into the power source at level 3.

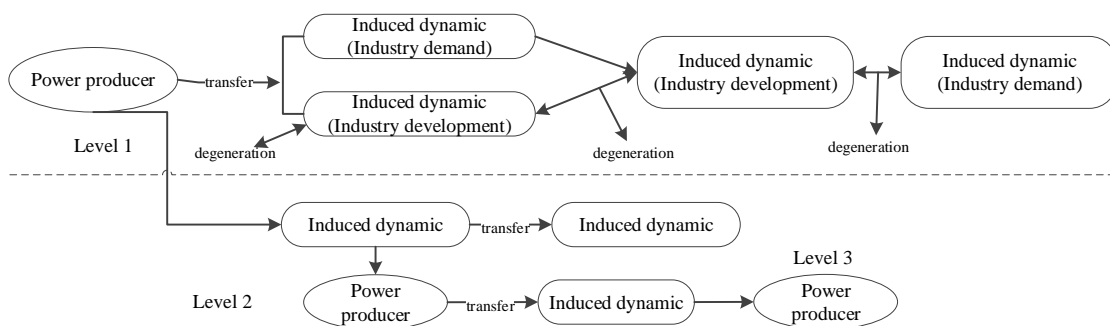


Fig 6: E-commerce market development power system

6.4 Analysis on Influence of Sustainable Development to Urban E-Commerce Competitiveness

The competitiveness of urban e-commerce is directly reflected in urban economic prosperity and comprehensive sustainable development and indirectly linked with urban residents' improved living standards and satisfaction with cities. The popularization of the internet, industrial attractiveness and the service quality of local e-commerce enterprises serve as the foundation of the sustainable development of e-commerce, and the performance of e-commerce depends on the transformation of element resources which is finally transformed into urban spiritual and material wealth in the new market environment. Sustainable development of urban e-commerce including sustainable urban development and improved urban residents' living standards is the ultimate goal of urban e-commerce competitiveness.

Urban e-commerce is a typical open system. According to the Self-organizing Theory, nonlinear differential equations are usually applied to describe the evolution process of urban e-commerce sustainable development if an open system is made into an orderly structure.

According to the viewpoint of System Theory, an urban e-commerce system is an open one that evolves with the passage of time and interacts with the outside world. This system can be divided into different and interactive subsystems according to different social functions. It's imperative for e-commerce to maintain sustainable development, which is of great significance to the sustainable development of the national economy. With innovation and opening-up of the subsystems, e-commerce is able to make progress sustainably, while innovation and opening-up make continuous adjustments that facilitate sustainable development of urban e-commerce (see Figure 7).



Fig 7: Influence of sustainable development force on urban e-commerce competitiveness

Industrial innovation serves as the foundation of e-commerce competitive advantages. As an emerging industry, the e-commerce industry is in urgent need of information technology and innovative talents (the main players driving innovation) [14]. Resources comprise a crucial part of e-commerce competitiveness and it can be brought into play through each enterprise's competency, while institutions affect the role of resources, the environment affects this process from outside and innovation resources generate wider heterogeneous resources through innovation capability [15]. However, imitating or exploring the path to transform e-commerce innovation resources to the accumulation of innovation capability makes enterprises face relatively strong cost constraints, which makes e-commerce innovation resources more valuable and e-commerce enterprises' competitive advantages more prominent.

The internet-based industry attracts traditional industries with its heterogeneous resources. By imitating or exploring the innovation paths of the internet-based industry, traditional industries make breakthroughs in industrial transformation and upgrading and obtain new competitive advantages which thereafter form sustainable competitive advantages with constant transitions. The driving force for e-commerce enterprises' transition mainly comes from industrial financing ability, corporate culture, open and dynamic ability, which are interrelated and interactive (see Figure 8).

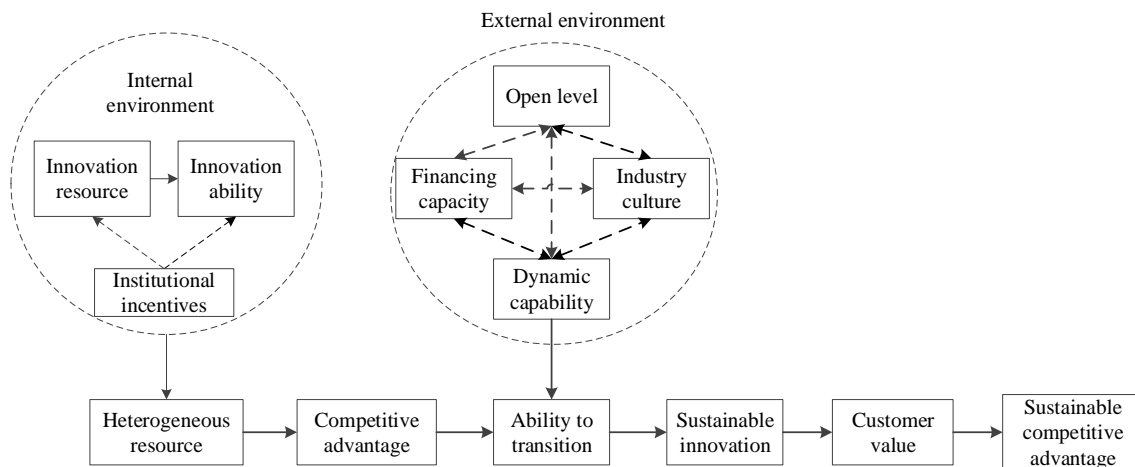


Fig 8: The logic of formation e-commerce sustainable competitiveness

The evolution of competitive advantages into sustainable development asks for continuous innovation and customer value (the right part of Figure 8). Innovation offers momentum for the development of e-commerce enterprises [16]. Traditional competition strategies focus on the changes of competitors while internet-based enterprises not only focus on competing for market shares, but also the acquisition of customers. Through continuous integration of resources, these enterprises strive for creating value for customers, cultivate an increasing number of loyal customers and obtain sustainable competitiveness.

VII. CONCLUSION

The BRMS model of urban e-commerce competitiveness is first of all a dynamic-static combination. The basic environment of e-commerce can only guarantee the competitiveness of a city at a certain point in time (i.e. static competition), but can not deeply reflect the challenges brought by urban development and changes of the times. Therefore, urban sustainable development should also be taken into consideration to reflect the dynamic competitiveness of e-commerce such as innovation, opening up, industrial demand, industrial expansion and resource agglomeration. Second, as e-commerce is an emerging industry based on the internet, the evolution of e-commerce competitiveness not only involves the impact of the urban policy environment, infrastructure, geological location on the basic environment, but also the impact of enterprises' service quality, market concentration and related industries on the aggregation of e-commerce resources. Third, the evaluation of urban e-commerce competitiveness is a complex procedure, which is the result of both internal and external factors of e-commerce. Internal factors determine the process of urban e-commerce.

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