Research on Regional Management and Industry Planning Based on Innovative Elements: A Case Study of Hangzhou Bay Area

Qin-Shi HUANG1,2,a, Xi-Gang ZHU2,b, Xuan JIANG2,c and Wei-Jin WU3,d

1 Zhejiang University of Science and Technology, Zhejiang 310023, China
2 Nanjing University, School of Architecture and Planning, Nanjing 210093, China
3 Hangzhou City Planning & Design Academy, Zhejiang 310012, China

a huangqinshi@zust.edu.cn, b zhuxigang522@hotmail.com, c 437941925@qq.com, d 98478298@qq.com

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Abstract. In the past decade, the economic development surrounding Hangzhou Bay has been in the ascendant, but the economic advantages of the regional growth alliance are not prominent. This paper analyzes the regional management and development mechanism of bay area industry from the perspective of innovation elements. Taking Hangzhou bay area as an example, this paper analyses the innovation foundation and spatial differentiation. The empirical results show that center effect, spillover effect and absorption effect caused the disorder of innovative elements. The integration of innovation elements, opening environment, industrial pattern and spatial structure will be effective ways to improve the regional cooperation.

Introduction

Under the influence of financial crisis and resource constraints, the transformation of industry challenges the current development mode, and bringing opportunities for industrial optimization and regional coordinated as well. Bay area economy is a unique economic pattern that is highly integrated by the costal economy, port economy, urban economy and network economy, with the geographical characteristics of bay areas. World Bank statistics show that 60% of the world’s aggregate economic volume is currently concentrated in the estuary, and 70% of the industrial capital and population are concentrated in the coastal zone which is 100 kilometers from the coast. Bay areas have become not only the key area of high quality competition and the catalysis of industrial revolution, but also the major engine of economic growth and technology innovation. Since the concept of Hangzhou Bay area was proposed in 2003, along with the implement of the Greater Bay national strategy in 2017, the economic circle around Hangzhou Bay is booming. At present, the container throughput of Hangzhou Bay is as high as 23.77 million TEUs, which is 1.6 times the sum of the total container throughput of the world’s three well-known bay areas. However, the economic advantages of the growth alliance of Hangzhou Bay are not prominent, and sometimes even falls behind in the competition of transformation. This is closely related to its low industrial correlation, imperfect functional layout, short industrial chain, and the lack of scale effect. Therefore, it is necessary to re-examine the constraints it faces from the perspective of innovation elements and to propose suggestions for planning and management.

The theory of regional innovation system was firstly proposed by Cooke [1]. Huang believed that regional innovation system was a regional policy network composed of various elements such as subject and environment elements [2]. Lu illustrated that the key to regional innovation was industrial innovation, which fundamentally and revolutionary forced the evolution of industrial transformation [3]. Doloreux point out that innovation systems were supported and stimulated innovation, which contributed to the creation, application and allocation of knowledge [4]. Zhao proved that the rapid development of hi-tech industries exerted prominent positive effect for the optimization and upgrading of technology structure [5]. Zhu proposed that the upgradation of industrial structure, processing degree and value chain were effective modes to realize industrial upgradation [6]. Liu
proposed the industrial upgrading theory from the perspective of global technology chain [7]. Ren believed that industrial innovation was the main aspect of industrial upgrading [8]. Based on the theory of regional innovation system, this paper analyses the regional management and development mechanism of bay industry from the perspective of innovation elements, and takes Hangzhou Bay as an example to analyze its innovation basis and spatial differentiation.

**Innovation-Driven Development**

Innovation-Driven development based on agglomeration, division, and interaction of innovation elements are necessary for success of regional management. For instance, the three world's typical bay areas, San Francisco Bay, New York Bay and Tokyo Bay are well known for their technology, finance, and industry, respectively. San Francisco Bay has great ability to localize new knowledge, new inventions and new technologies from around the world. 101 unicorn companies are located in San Francisco Bay area, including Google, Facebook, Hewlett-Packard, Intel, and Apple, integrating science, technology and production, dominating the world in the fields of information technology, new materials, new energy, and bio-pharmaceuticals [9]. Similar to San Francisco Bay Area, New York Bay Area has been benefited from its innovative industry chain since 1920, including manufacturing and port industry, finance and insurance industry, biomedicine and nanotechnology industry. There are 56 universities near New York. These world's typical universities and talents provide steady streams of technology innovation for New York Bay Area, boosting the vigor of companies. Similarly, an open innovation ecosystem is the core of the success of Tokyo Bay Area. In 2017, Tokyo Bay ranked the first in the global innovation level, with 38 Fortune 500 companies, more than 300 top technology companies, more than one-fifth of Japan’s universities, one-fourth of private research institutions. In addition, it has almost all major financial institutions in Japan, such as multinational banks, and headquarters of insurance, securities and futures companies. The integration of various high quality platform resources contribute to the spillover of innovation to the rest of Japan and the world. The geographical location of the three world's typical bay areas were showed in Fig.1.

From the successful experiences of world's typical bay areas, we can see that favorable policies, sound system, adequate investment, and a highly-correlated industrial chain are both the reasons and the results of innovation elements taking roots in these areas. These experiences are great reference for the developing special urban agglomeration such as the Hangzhou Bay area. There are three underlying reasons. Firstly, the innovation cycle between between industry, academia and research promotes the scientific and technological innovation in bay area. Concentrated universities and research institutions have greatly promoted the knowledge production, technology commercialization and innovation diffusion in the bay area. Secondly, favorable policies and generous payment attract a large number of scientists and other immigrant talents to settle down in the bay area. Thirdly, venture capital not only provides early start-up funds for technology companies, but also helps companies build their own team and acts as a catalyst for the incubator. Fourthly, advanced innovation system and culture help to achieve the flow and production knowledge [10].

![Figure 1. Geographical Location of San Francisco, New York and Tokyo Bay Area.](image)
Innovation Foundation and Regional Differences

Industrial Foundation

Hangzhou Bay area has a solid foundation, compared with those world’s typical Bay Area. In 2017, the gross regional product of the core area around Hangzhou Bay reached 4540 billion yuan, accounting for 5.5% of the total economic volume of the country. The GDP per capita was $14899, higher than the national average of $8,827, which had reached the level of developed countries. Hangzhou Bay links Taizhou Bay, Sanmen Bay, Xiangshan Bay, Yueqing Bay, covering eight cities including Hangzhou, Ningbo, Jiaxing, Shaoxing, Huzhou, Taizhou and Zhoushan. It has a sound foundation in transportation, port, trade, e-commerce, culture and other aspects, which can make it comparable to the world's typical bay area. However, it is also confronted with disadvantages such as low degree of regional integration and uneven industrial level\[11\]. As Fig.2 shows, the industrial development level among Hangzhou Bay area still has a huge gap. Hangzhou has advantages in information economy, creative culture, financial, tourism, health, fashion, and high quality equipment industry. While, Ningbo has advantages in automobile manufacturing, green petrochemical, textile and garment, smart home appliances and clean energy industry. Shaoxing has advantages in textile, chemical metal processing, yellow rice wine and pearl industry. Jiaxing has advantages in textile and garment, leather and chemical fiber, electronic information and equipment industry. Huzhou has advantages in new metal material, green furniture, modern textile and fashion industry.

Innovation Elements

The core area around Hangzhou Bay has been equipped with relatively high-quality scientific and creative resources and achievements. According to statistics in 2016, there are 11 “211” universities, 7908 firms and scientific institutions above scale located in Hangzhou Bay, which provides the stream of knowledge and technology for development. 1.303 million college students, talents with undergraduate degree and above and 381 thousand R&D researchers formed a large pool of innovative talents. 10.58 billion regional research investments and 28600 invention patents reached reflect the high level of innovation capability in Hangzhou Bay. The spatial paradigms inherent in innovation elements are mainly embodied in science and technology city, high-tech zone, listed companies, and innovative and entrepreneurial towns. On the one hand, high-tech zones provide the nutrition for the cultivation, growth and prosperity of innovation elements. On the other hand, a large number of large-scale domestically listed companies have become excellent places for absorbing and integrating innovation elements. As of August 2017, there were 551 domestically listed companies in
Hangzhou bay area. In 2016, the amount of M&A transactions reached 186.3 billion yuan. These listed companies are playing important roles in promoting industrial upgrading and in leading the growth of many small- and micro-scale companies. The innovation elements in the core area of the Hangzhou bay show a disordered distribution in space.

Regional Differences

The innovation elements in the core cities of Hangzhou Bay present a disorder distribution in space [12]. Innovation elements are highly concentrated in Hangzhou and Ningbo, but separated and low concentrated in Jiaxing and Shaoxing. Firstly, the central effect of Hangzhou and Ningbo is obvious. In 2016, the R&D expenditure in Hangzhou (34.64 billion) and Ningbo (20.68 billion) were much higher than in other regions. Secondly, the spillover effect of Hangzhou and Ningbo is evident. This can be reflected specifically by the R&D intensity in Zhejiang Province in 2016. The R&D intensity is 3.13% for Hangzhou, followed by Jiaxing with a ratio of 2.81%. Thirdly, the absorption effect of Hangzhou and Ningbo is clear. Innovation elements tend to flow to Hangzhou and Ningbo, and thus exerting negative effects on the integration of innovation resources in Shaoxing and Zhoushan. In 2016, the R&D intensity of Shaoxing is 2.4%, which was lower than Hangzhou by 0.7%, while R&D intensities of other cities such as Zhoushan and Huzhou were all lower than the national level, 2.11%.

Regional Management and Industry Innovation

Regional Management

The Hangzhou Bay area has great potential to become a world’s typical bay area, but the disorder of innovation elements has hindered the industrial innovation. Therefore, the primary task of industrial planning and management for Hangzhou Bay area is to achieve the integration of innovation elements, the specific path of which can be divided into three stages. In the first stage, variation in division of labor across industrial chain should be conducted, taking the local industries into consideration. In the second stage, open and connected internal and external environments established based on investment, propaganda, policy support are needed. In the third stage, the industry form should be upgraded. At last, a systematic Greater Bay industrial structure should be established.

Industry Division

Differentiation of industry division can help clarify the key points of industrial development in cities around Hangzhou Bay, gather special funds and professional talents, implement well-focused policies of technology and institutional innovations. By encouraging innovation hotspots in different cities and decentralized innovation input with low competitiveness, the imbalance distribution of innovation elements in Hangzhou Bay can be alleviated. On the one hand, it is necessary to further extend the concentration center of innovation elements, supporting core area extensions and construction of sub-zones, as to amplify the radiation effect. On the other hand, it is important to strengthen the absorption effect of disadvantage areas. Making full use of the innovation platforms, such as the G60 innovation corridor, and beautiful natural environment, the development of disadvantage areas will be encouraged to become national high-tech zones.

Opening Environment

Creating an open industrial environment is fundamental for promoting the flow and integration of innovation elements. First of all, we should accelerate the construction of major integrated transportation corridors along the coast around and across Bay areas, including world-class highways, seaports, airports, which provide the access to other countries. Secondly, we should further attract talents and accelerate the establishment of the competitive developing environment for talents. Thirdly, we should increase publicity and actively create platforms for major events, such as holding the national event International Forum for Economic Development of Hangzhou Bay. Fourthly, we should promote the construction of high-level free trade pilot zones, electronic world trade platforms.
(eWTP) pilot zones and international hardware outsourcing facilities such as service outsourcing trading base.

**Industrial Pattern**

In the process of integrating the innovation elements in Hangzhou Bay area, the high quality of industries is inevitable. Specifically, depending on the three major technology corridors and core industries, we should start from building a advanced manufacturing cluster and national digital economy demonstration zone. We should select a group of industries with great advantages in core technologies, complete industry chain and the supply of backbone companies, and accelerate the construction of a number of new national and provincial industrial demonstration bases. Secondly, upgrade traditional industries. We should stick to the strategy of implementing different policies for different industries, providing different guidance for different categories. In addition, we should strengthen the policies of Internet, Robotics, Big Data and Brand, enhancing the control by means of technology for industrial value chain. Thirdly, vigorously develop high-tech service industry. We should focus on the information and technology service industry and business service industry such as cloud computing, big data, software, artificial intelligence and e-commerce. In addition, we should promote entrepreneurship, innovation for the public, and encourage cross-border integration and cooperation. Fourthly, build the emerging financial center. Led by Qiantangjiang Financial Harbor, the integration of finance and technology should be promoted, to seize the opportunities to apply technologies such as artificial intelligence, block chain, and biometrics. We should support the clustering development of financial organizations, and establish the National Venture Capital Experimental Zone centered on Hangzhou, gathering a group of world’s typical venture capital institutions and technology financial institutions.

**Spatial Structure**

The final result of integration of innovation elements is the formation of industry system, with close connection and efficient cooperation. The most reasonable spatial mode of the Hangzhou Bay area is one port, two poles, three corridors, four new districts [13]. One port is a free trade port, the focus of planning and management of which is to give play to the advantages of the free trade zone, promote the cooperation among Zhejiang, Shanghai and Yangshan, accelerate the integration of Meishan and Liuheng, to build a high-level free trade pilot zone in China (Zhejiang), and to become a free trade port. Two poles, namely the Hangzhou Metropolitan Area and the Ningbo Metropolitan Area, aim to promote the integration of Ningbo and Hangzhou, to drive the development and accelerate the opening of the entire Greater Bay area. Three corridors, namely the West Hangzhou Technology Innovation Corridor, East Ningbo Technology Innovation Corridor, Jiaxing G60 Technology Innovation Corridor, are expected to introduce and build internationally renowned research institutes, promoting the connection and integration among industrial platforms and technology innovation platforms, with high-tech zones, high-education parks, technology cities as the foundation. Four new districts are Hangzhou Jiangbin New District, Ningbo Huanwan District, Shaoxing Binhai New District, Huzhou Southern Taihu New District. It is required that these places should be built as modern districts where the cities are integrated with industries and human coexist with the nature harmoniously.

**Conclusion**

This paper reexamines the development mechanism of bay area industry from the perspective of innovation elements. It holds that innovation elements are an important condition for restricting and guiding bay area industry innovation, and innovation integration is an effective way for bay area industry planning and management. It takes the core cities in Hangzhou bay as an example and analyses the innovation base and the factor space differentiation characteristics, finding that the center effect, spillover effect and absorption effect caused the disorder of innovative elements. Starting with this problem, this paper puts forward a set of planning and management idea guided by the integration of innovative elements of the, which involves adjusting measures to local conditions to
arrange the industrial chain division of differentiation, then building the open industrial environment conducive to communication and cooperation. On this basis, high quality industrial form and systemization of industry space will come true. This paper intends to provide reference for the efficient upgrading of bay area industry through the theoretical practice of Hangzhou bay.

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