

Article

Research on Mechanism of Building Synergistic Competitive Advantages of Industries in Guangdong-Hong Kong-Macao Greater Bay Area

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Abstract: The Guangdong-Hong Kong-Macao Greater Bay Area is positioned as the most active bay with a high technological level and the strongest innovation capabilities in the global market. As the cities in the Greater Bay Area are pursuing the integration of management, technology, and enterprise innovation, and emphasizing the development of collaborative innovation, it is important at present to effectively promote the high-quality development of the regional economy and industry. Thus, we apply the basic concepts of industrial theories in the methods of research and summarize four aspects to explore the research topic. We find that leading companies need to be given the responsibility of building an industrial ecosystem and realizing self-evolution through digital transformation in creating a niche for disruptive innovation and development. Furthermore, enterprises need to form industrial chain clusters through the extensional development method of investment and M&A. In addition, enterprises need to build a new industrial aircraft carrier through collaborative competition to realize the expansion of the industrial ecology of the Greater Bay Area in the future.

Keywords: Greater Bay Area, Disruptive Innovation, Synergistic Competition, Driving Factors, Industry Chains

1. Introduction

To make the Guangdong-Hong Kong-Macao Greater Bay Area (Greater Bay Area) be a world-class area with world-class cities, it is necessary to accelerate the cooperation and integration of industries within the region and enhance the comprehensive strength. The area plans to form an economic system and development model with innovation by 2035, to enhance its international competitiveness and influence the region through the overall and substantial leap in economic and technological strengths. Then, the Greater Bay Area becomes a world-class bay area that is livable, suitable for business, and suitable for travel.

In this context, to enhance the regional cooperation with Hong Kong and Macao, Guangdong has regarded innovation-driven development as its core strategy and overall starting point of economic restructuring in recent years, and innovation has become the main driving force for their development. With the construction of the Pearl River Delta National Demonstration Area of Autonomous Innovation and the Pilot Province for Comprehensive Innovation Reforms, they are preparing for the establishment of the Guangdong National Greater Science Center, the new Guangdong Academy of Sciences and initiating the construction of high-level universities, science, and engineering universities and key disciplines. It has helped Guangdong keep the number of effective invention patents and PCT international patent applications ranking first in the country.

However, how different cities with different basic economic environments and levels of positioning make the best use of innovative strategies is a question to form synergistic competition with industries, and break through the current predicament in the Greater Bay Area. The three-year Action Plan (2018–2020) of Guangdong Province was implemented to promote the construction of the Greater Bay Area. The analysis of existing helps us understand the current development status of the cities and prepare for the plan of the Greater Bay Area for 2035.

In recent years, studies on industries in the Greater Bay Area have sprung up. By analyzing the problems and constraints in the coordinated development of the Greater Bay Area, Huang et al. (2020) proposed a mechanism led by leading cities and a mechanism of shared resources and collaborative and supportive industries. Jiang (2020) suggested that promoting industrial upgrading, coordinated development and the formation of world-class industrial clusters be an important way for the Guangdong-Hong Kong-Macao Greater Bay Area to develop into a world-class bay area in terms of economic strength. Ma et al. (2020) proposed that the integrated development strategy of the Guangdong-Hong Kong-Macao Greater Bay Area should start with economic belt

construction, transportation network construction, economic corridor construction, and the construction of a coordination mechanism.

Sun (2021) pointed out that regional industrial coordination is an important measure to support the development of the Greater Bay Area, but there are still many restrictive factors in the current implementation of measures. Xu (2021) believed that the path of industrial cooperation and development in the Greater Bay Area should be the overall coordination of the innovation chain, industrial chain, and value chain. Zhang and Tan (2021) analyzed the level of high-quality economic development of the Greater Bay Area and the cities in the area from 2011 to 2017 and believed that the overall level of high-quality economic development in the Greater Bay Area was on the rise, but there were differences in the contribution of different dimensions to the level of high-quality economic development. He (2021) found that the Greater Bay Area was one of the regions with the highest degree of openness and strongest economic vitality in China, and had an important strategic position in the overall national development. Dong et al. (2021) showed that in the green innovation of the Greater Bay Area, the long-term mechanism for the implementation and conversion of green innovation achievements should be accelerated. It is the effective connection between green innovation and the industrial chain with the education and talent chain promoted to reduce the institutional transaction cost of inter-regional collaborative innovation.

Based on the analysis of data from 11 cities in the Guangdong-Hong Kong-Macao Greater Bay Area from 2008 to 2017, Peng et al. (2021) found that the factor productivity of central cities in the Guangdong-Hong Kong-Macao Greater Bay Area was different from other cities. Tian et al. (2021) pointed out that the traditional agricultural business model no longer matched the development of the Greater Bay Area, and urban agriculture was the future direction of development. Peng (2021) claimed that the Greater Bay Area should make full use of its advantages to promote the development of industries and increase the in-depth cooperation in technological innovation and industries between the Pearl River Delta, Hong Kong, and Macao.

Recently, the coordinated integration of regional economies has become a topic of general public concern. The widespread use of the mechanism of building synergistic competitive advantages of industries has also led to the popularity of the coordinated model of regional economic systems (Hu, 2006; Lee, 2008). Under the regional economic innovation system, the interaction mechanism of industrial transfer and innovation capability must be integrated (Zhang, Wang, and Ma, 2016), and the competitive advantage of strategic alliances can be obtained (Meng and Han, 2008).

The above research on the coordinated development of industries in the Greater Bay Area shows that most studies focus on the degree of industrial coupling and coordination between the single region and individual industrial systems and less focus on the degree of orderliness and comprehensiveness about overall regions. In terms of research, they tend to focus on single aspects of the industry and seldom conduct comprehensive analyses from multiple levels. Although they used quantitative analyses of geospatial methods, they rarely adopted the multi-aspect analysis method of industrial analysis to explore the issue of the synergistic competitive advantage of industries in the Greater Bay Area. Therefore, we attempt to observe the innovative energy of major cities in the Greater Bay Area through innovation theory and apply the multi-aspect analysis method for their industrial analysis of them. We also put forward the relevant argument about the value network of industrial disruption-innovation, which serves as the countermeasures to guide the future development of cities in the Greater Bay Area.

2. Materials and Methods

Industry analysis can be roughly divided into three categories: (1) National-level overall industry analysis, (2) macro-level analysis by industry, related industries or sub-industry (Meso level), and (3) micro-level analysis of individual firms. These three methods are selected at different times according to different needs. In addition, according to the practical procedures and content of industry analysis, these methods are divided into the following five categories: (1) collection and preliminary analysis of industry data, including primary and secondary data analysis, (2) Analysis of industrial structure and market, (3) analysis of industry synergy and competition, (4) analysis of driving factors and key factors of industries, and (5) industry data and strategic analysis.

Based on the above methods of industrial analysis, we apply the basic concepts of industrial theories to the steps and methods of analysis. Therefore, this research is carried out with the following four aspects.

- (1) General analysis of the Greater Bay Area
- (2) Analysis of the innovation-driven and reform-led Greater Bay Areas' development
- (3) Analysis of the energy of innovation and development of cities in the Greater Bay Area
- (4) Analysis of the application of disruptive innovation-value network in the Greater Bay Area

3. Analysis and Results

3.1 General analysis of the Greater Bay Area

3.1.1 Economic overview

Owing to the impact of the Sino-US trade war, the 2019 economic performance of all regions in the country was not as good as in 2018. However, the profits of industrial enterprises above the scale have been realized in Guangdong Province, as shown in Table 1. The total profit realized was as high as 891.528 billion yuan, which was an increase by 5.7% over 2018, reaching 5.6%, higher than the performance of the country (an average of -3.3%), Shanghai (-14.2%), Jiangsu (-5.4%), and Zhejiang (5.4%).

Table 1. Profits realized by industrial enterprises in 2019

Quarter	National		Guangdong		Jiangsu		Zhejiang		Shanghai	
	Total profit (100 million yuan)	Increase over the previous year (%)	Total profit (100 million yuan)	Increase over the previous year (%)	Total profit (100 million yuan)	Increase over the previous year (%)	Total profit (100 million yuan)	Increase over the previous year (%)	Total profit (100 million yuan)	Increase over the previous year (%)
Q1	12,972.0	-3.3	1,630.9	2.3	1,497.9	-6.7	855.5	2.9	618.0	-21.3
First half of the year	29,840.0	-2.4	3,881.9	-2.3	3,498.9	-3.0	2,191.8	5.4	1,358.2	-24.2
Q1-3	45,933.5	-2.1	6,383.6	3.0	5354.0	-4.5	3,476.7	2.8	2,139.0	-15.6
Whole year	61,995.3	-3.3	8,915.3	5.6	6733.8	-5.4	4,759.5	5.4	2,874.5	-14.2

Source: Industrial Traffic Statistics Department; Analysis of the economic benefits of industrial enterprises above designated size in Guangdong in 2019.

The performance of the service industry above the designated size is shown in Table 2. In 2019, the number of service companies in Guangdong Province ranked first in the country. Among them, the operating income of enterprises of Guangdong Province was 3,146.81 billion yuan, which was lower than that of Beijing, but higher than the others. Its' annual growth rate was 11.8%, second only to Zhejiang and higher than the whole country, Shanghai, and Beijing. The operating income of other for-profit service companies was 1,450.8 billion yuan, which was lower than those in Beijing, Shanghai but higher than that in Zhejiang and other places. Compared with 2018, the annual growth rate of for-profit was 15.5%, which was only lower than that of Zhejiang and higher than the national average, and those in such places as Shandong and Beijing.

Table 2. Comparison of operating income of service industry above designated size in 2019

Region	Number of enterprises	Service industry above designated size			Other for-profit service industries		
		Operating income (100 million yuan)	Increase over the previous year (%)	Increase or decrease in Guangdong and the whole country and major provinces	Operating income (100 million yuan)	Increase over the previous year (%)	Increase or decrease in Guangdong and the whole country and major provinces

				and cities (%)			and cities (%)
The whole country	168,209	218,923.3	9.4	2.4	89,272.3	14.2	1.3
Guangdong	24,555	31,468.1	11.8	-	14,508.0	15.5	-
Beijing	15,033	38,908.8	7.9	3.9	21,600.2	10.3	5.1
Shanghai	11,535	31,293.9	10.1	1.7	15,621.4	11.4	4.1
Jiangsu	16,376	15,427.9	7.2	4.6	6,014.7	11.5	3.9
Zhejiang	11,209	18,284.2	16.3	-4.5	10,451.4	20.8	-5.3
Shandong	9,052	7,682.5	8.0	3.8	1,737.4	15.4	0.0

Source: Service Industry Statistics Department; Analysis on the operation of Guangdong's Service Industry above designated size in 2019

3.1.2 Economic conditions of central and node cities in Guangdong

In 2019, Shenzhen had the highest total production volume among the major cities, reaching 2,692.7 billion yuan, and Guangzhou and Foshan were the cities with total production volume exceeding one trillion yuan in order. Dongguan's total production volume reached 900 billion yuan, and cities with a production scale of fewer than 500 billion yuan included Huizhou, Zhuhai, Jiangmen, Zhongshan, and Zhaoqing. The production scale of the cities with the highest and lowest production scales differed by more than 12 times. In terms of per capita GDP, that of Shenzhen was 190,000 yuan, ranking one and because Zhuhai had the smallest population (about 1.76 million people), its per capita GDP was 159,000 yuan, ranking second, followed by Guangzhou (155,000) and Foshan (128,000), and Zongshan (111,000). Shenzhen's per capita GDP was 3.5 times that of Zhaoqing, as shown in Table 3.

Table 3. Comparison of GDP of cities in the Guangdong-Hong Kong-Macao Greater Bay Area

City	GDP in 2019 (100 million yuan)	GDP per capita in 2018 (ten thousand yuan)	industry structure (proportion) - agriculture: industry: service
Shenzhen	26,927.09	19.0	0.1 : 41.2 : 58.7
Guangzhou	23,628.6	15.5	1.0 : 27.3 : 71.8
Foshan	10,751.02	12.8	1.5 : 56.5 : 42.0
Zhuhai	3,435.9	15.9	1.7 : 49.2 : 49.1
Dongguan	9,482.5	9.9	0.3 : 48.6 : 51.1
Huizhou	4,177.4	8.5	4.3 : 52.7 : 43.0
Zhongshan	3,101.1	11.1	1.7 : 49.0 : 49.3
Jiangnan	3,146.6	6.3	7 : 48.5 : 44.5
Zhaoqing	2,202.0	5.3	15.7 : 35.2 : 49.0

Source: <https://www.bayarea.gov.hk/tc/about/macao.html>.

From the perspective of the three industrial structures, Shenzhen and Dongguan were gradually shifting from industry to service industry, while Guangzhou was always based on the service industry. In Zhongshan and Zhuhai, there was a little gap between the development of industry and service industry, and Foshan, Huizhou, and Jiangmen were dominated by industrial development. Industrial development in Zhaoqing was not as good as the service industry, while agriculture was more developed.

As for the major development zones of each city, Shenzhen has 6 national-level development zones and the 2 areas of China (Guangdong) Pilot Free Trade Zone, which is connected with Hong Kong. Due to its early development, Guangzhou has 9 national-level development zones and 4 provincial-level development zones with one of China's (Guangdong) Pilot Free Trade Zones to promote in-depth cooperation between Guangdong and Hong Kong and has built technological innovation and transformation platform. Like Huizhou, Foshan has six provincial development zones. Although Foshan has only one national-level development zone, its economy is developing rapidly, driven by the strategy of Guangzhou-Foshan integration. Even if Huizhou has 2 national-level development zones and is close to Shenzhen and Guangzhou, its economy is not as good as Dongguan's, which is located on the golden core central axis of "Guangzhou-Dongguan-Shenzhen-Hong Kong". The golden core central axis also drives Dongguan, which has only 1 national-level zone and 3 provincial-level parks and helps Dongguans' economy to quickly surpass regions such as Huizhou and Zhuhai, which developed earlier.

Jiangmen, known as the hometown of overseas Chinese, covers a large area. Its agriculture industry accounts for 7%, second only to Zhaoqing. Jiangmen has held 1 national-level zone and 2 provincial-level parks, a neutrino experiment base, a logistics hub radiating west Guangdong, and the planning of automotive equipment and motorcycle industry bases to accelerate the development of the high-tech and logistics industry in the future. Although both Zhongshan and Zhaoqing have 1 national-level zone and 1 provincial-level park, the former is located close to Guangzhou and has been developed earlier with traditional industrial clusters such as home appliances, clothing, lighting, and furniture. In addition, the Greater Bay Area creates a "Foshan-Zhongshan-Zhuhai-Macau" secondary development axis, so Zhongshan city has developed more potential. The latter covers the largest area among the cities compared, agriculture accounts for up to 17%, and it is one of the main grain-producing areas in Guangdong. The industrial development of Zhaoqing is still dominated by traditional industries such as textiles and apparel, food and beverage, furniture, building materials, and metal products.

3.2. Formatting of Mathematical Components

The Outline of the Development Plan for the Guangdong-Hong Kong-Macao Greater Bay Area has been announced more than two years ago. The Greater Bay Area comprises 4 central cities (Guangzhou, Shenzhen, Hong Kong, Macao) and 7 node cities (Zhuhai, Foshan, Huizhou, Dongguan, Zhongshan, Jiangmen, and Zhaoqing) with a population of more than 70 million and a total GDP of more than 10,000 Billion yuan, ranking first in the country. To be an area with world-class bay cities, the Greater Bay Area is accelerating the cooperation and integration of industries within the region to enhance its comprehensive strength, hoping to form an economic system and development model with innovation as the main support by 2035. It is the goal to enhance the international competitiveness and influence of the region through the overall and significant leap in economic and technological strengths, and become a world-class bay area that is livable and suitable for business and travel.

According to the requirements of the Opinions on Implementation of the Outline of the Development Plan for the Guangdong-Hong Kong-Macao Greater Bay Area issued by the Guangdong Provincial Party Committee, the Greater Bay Area need to build an international science and technology innovation center. The basic principles of the outline are to emphasize innovation-driven and reform-led development. It is the future of the Greater Bay Area to deeply implement the strategy of innovation-driven development, vigorously strengthen the building of basic innovation capabilities, and do the best to make breakthroughs in key and core technologies. Therefore, it is also the objective of the Greater Bay Area to enhance rapid independent innovation and the ability to transform scientific and technological achievements, continuously optimize the regional innovation environment, and create an important source of technological innovation and emerging industries.

In July 2019, Guangdong Province issued the Opinions of the Guangdong Provincial Committee of the Communist Party of China and the People's Government of Guangdong Province on the Implementation of the Outline of the Development Plan for the Guangdong-Hong Kong-Macao Greater Bay Area and Three-year Action Plan of Guangdong Province to Promote the Construction of the Greater Bay Area (2018-2020), clarifying the timetable, road map and task book for advancing the construction of them. The purpose is to accelerate the realization of the development plan of the four major central cities and five major node cities in the development plan of the Greater Bay Area. Guangdong is joining Hong Kong and Macao to speed up the construction of the Greater Bay Area and to build a world-class bay area and city cluster. As shown in Table 4, the positioning plans of cities in the Guangdong-Hong Kong-Macao Greater Bay Area are announced.

Table 4. Positioning of 11 cities in the Guangdong-Hong Kong-Macao Greater Bay Area

City	Positioning
Hong Kong	To develop into a more competitive international metropolis.

Macao	To promote moderately economic diversified and sustainable- development. (Gaming and gaming intermediaries are its main pillar industries.)
Guangzhou	To create a high-level opening gateway and hub, and become a core gateway city in the Greater Bay Area city cluster. (Concentrated in Nansha Guangdong-Hong Kong-Macao Intensive Cooperation Zone, Sino-Singapore Guangzhou Knowledge City, and Guangzhou Financial City.)
Shenzhen	To be an innovative and creative capital with world influence.
Zhuhai	To be an innovation highland in the Guangdong-Hong Kong-Macao Greater Bay Area.
Dongguan	To be a world-class advanced manufacturing center.
Foshan	To be a national manufacturing innovation center. (One of the leaders of the "Pearl River-Xijiang Economic Belt")
Huizhou	To be a highland for the transformation of scientific and technological achievements; a strategic hinterland and hub gateway on the east coast of the Greater Bay Area.
Zhongshan	To be a world-class advanced manufacturing base, an industrial innovation center, and a historical and cultural city.
Jiangmen	To be a hub and gateway city in the west wing of the Greater Bay Area.
Zhaoqing	To be a hub and gateway city, connecting the Pearl River Delta to the southwest cities.

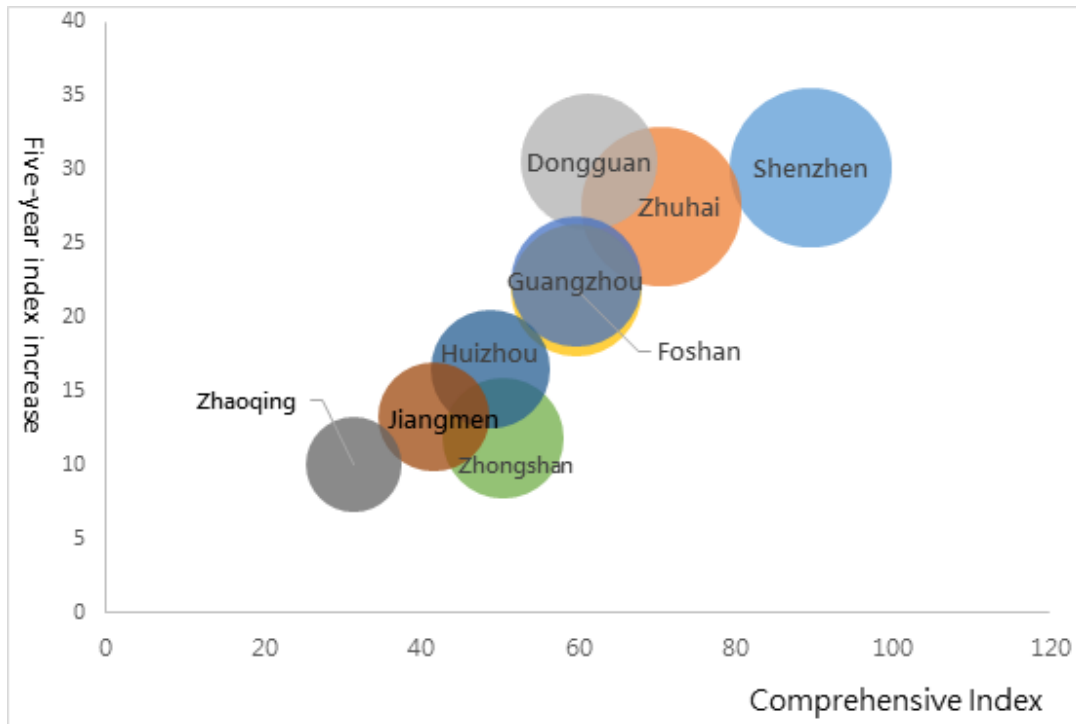
Source: Hong Kong Trade Development Council and <https://home.hktdc.com/tc/>

3.3 Analysis of energy for innovation and development of cities in the Greater Bay Area

Innovation has always been one of the core themes for the development of the Greater Bay Area. President Xi Jinping once pointed out that the vitality of theories lies in innovation. Innovation is the eternal theme of the development of philosophy and social sciences, as well as an inevitable requirement of social development, deepening of practice. It is also to improve the advancement of history in philosophy and social sciences. In the process of innovative development, China needs to learn from the historical experience and lessons of developed countries and integrate with China's reality thing to solve its problems, and continues to innovate in theory and policies.

The comparison of Guangdong's economic performance with major provinces and cities in 2019 revealed that its performance ranked top in the country in terms of industry and service in the report Research on Innovation-Driven Development of Industrial Economy in the Guangdong-Hong Kong-Macao Greater Bay Area by the Guangdong Statistics Bureau in 2020. After jointly signing the Framework Agreement for Deepening Cooperation among Guangdong, Hong Kong, and Macao and Promoting the Construction of the Greater Bay Area in 2017, the three regions actively sought policy breakthroughs with innovative and open thinking and promoted the development of the Greater Bay Area.

Therefore, this study aims to review the "evaluation indicators for innovation-driven development of industrial enterprises" composed of 6 primary indicators, respectively the R&D of Enterprise personnel, investment, output, and institutions, technological transformation, and innovation environment, and 11 secondary indicators such as number of invention patent applications and authorizations, number of high-tech enterprises. In 2018, the total industrial added value of the Guangdong-Hong Kong-Macao Greater Bay Area was 2,820.25 billion yuan with an increase of 623.46 billion yuan over 2013 and an average annual growth rate of 5.1%, mainly in the Pearl River Delta. Shenzhen's total industrial economy accounted for the highest proportion, accounting for 32.3% in 2018, followed by Foshan and Guangzhou, accounting for 16.3 and 15.8%, respectively, and Hong Kong accounting for 1.9%.



Source: Research on Innovation-Driven Development of Industrial Economy in the Guangdong-Hong Kong-Macao Greater Bay Area published by the Guangdong Statistics Bureau.

Figure. 1. Gap of "Comprehensive Index for Innovation-Driven Development of Industrial Economy" of each city from 2013 to 2018

By observing the "Comprehensive Index for Innovation-Driven Development of Industrial Economy" by the city from 2013 to 2018, As shown in Figure. 1, the city with the greatest increase was Dongguan by 30.54 in 2018 over 2013 followed by Shenzhen (30.11), Guangzhou (22.44), Zhuhai (27.48), Foshan (21.86), Zhongshan (11.86) and Zhaoqing (10.09). Further analysis of the content of the detailed indicators showed that in 2018, Shenzhen, ranked first in comprehensive indicators, had made achievements in encouraging enterprises to invest in R&D and opening R&D institutions, but it needed to further increase the transformation of industrial technology. Therefore, the growth rate of the comprehensive index was slightly lower than that of Dongguan in these five years.

Zhuhai, which ranked second, had made achievements in encouraging R&D personnel and enterprises to invest in R&D. However, it needed to further expand its investment in R&D institutions and industrial technology transformation. Therefore, its comprehensive indicators showed a slightly lower growth rate than that of Dongguan and Shenzhen in these five years.

Dongguan's comprehensive indicators had improved significantly in these five years and had achieved certain advantages in enterprise R&D output and technological transformation. Although its performance ranked third among the cities in the Pearl River Delta in 2018, which was lower than Shenzhen and Zhuhai, long-term continuous improvement of Dongguan allows itself to achieve the highest comprehensive indicator increase in five years.

Guangzhou is an area with earlier economic development in the region and has advantages in R&D institutions and corporate R&D investment. However, it is slightly worse than other regions in terms of the proportion of R&D personnel and investment in technological transformation. From 2013 to 2018, Guangzhou's comprehensive indicators increased by 22.44, which was lower than that of Shenzhen, Dongguan, and Zhuhai.

Foshan was dominated by industry and was famous for the coordinated development of the three major industries of equipment, home appliances, and non-metallic mineral products. In 2018, Foshan's industrial added value ranked second among the cities in the Pearl River Delta. However, its innovation-driven development did not match its status as a major manufacturing city, and Foshan only had its comprehensive indicators ranked fourth with a score lower than those of Shenzhen, Zhuhai, and Dongguan. Notwithstanding, Foshan has set about the successive development of ten major industrial zones during 2013–2018 and was the country's largest home appliance and industrial design base. Because Foshan has made great progress in the "enterprise technological transformation" and "enterprise-innovation environment" and other indexes, its composite index score increased by 21.87, closely behind Guangzhou.

Based on the aforementioned urban development situation, Hong Kong and Macao still focus on the service industry due to their geographic location, original industries, and future positioning in linking the development of the Greater Bay Area. The former focuses on industries with high added value and low employment, such as finance, and industries with low added value and high employment, such as logistics, tourism, and commerce, while the latter is dominated by gaming and tourism.

Furthermore, the major city development trends in the Guangdong-Hong Kong-Macao Greater Bay Area are observed based on their current industrial layout (Figure. 2), composite index performance, and future positioning in the development of them. We find that the plan is to drive the development of the West Bank secondary axis through the linkage between the east and the west and the golden core axis of Hong Kong, Shenzhen, Dongguan, and Guangzhou, thus proposing high-level technological innovation carriers and platforms in the Greater Bay Area. The cities hope to promote technological innovation corridors in the Greater Bay Area such as Guangzhou, Shenzhen, Hong Kong, and Macao.

Guangzhou plans to be the country's innovation center city, dominated by modern manufacturing and industrial and commercial services and form the Guangzhou-Foshan-Zhaoqing metropolitan circle. Moreover, it wants to rebuild Shenzhen as a national innovation city, a national independent innovation demonstration zone, and an international innovation center with global influence. Shenzhen also integrates Hong Kong's modern service industry and financial industry to form a Hong Kong-Shenzhen-Dongguan-Huizhou metropolitan circle. Besides, Macao and Zhuhai will jointly build into an international innovative city and an important pioneer area for the innovation cooperation of Guangdong, Hong Kong, and Macao. The Macao-Zhuhai-Zhongshan-Jiangmen metropolitan circle will dominate tourism and green economy, and modern manufacturing.

Therefore, these cities have increased their innovative energy with the deepening of regional industrial coordination and cooperation, so they have performed relatively well in terms of innovation-driven industrial economic development. This is a gradual improvement model through continuous innovation activities of industrial collaboration and resource integration to drive regional cities to extend to both ends of the value chain. The front end is technology research and development and the back end is market expansion.



Source: <https://www.qianzhan.com/analyst/detail/220/180725-d0de8f2a.html>.

Figure. 2. Existing industrial layout of major cities in the Guangdong-Hong Kong-Macao Greater Bay Area

Zhongshan and Huizhou are close to the golden core axis of Hong Kong-Shenzhen--Dongguan-Guangzhou. The former owns four major industrial clusters, including home appliances, and is located in the center of the secondary axis on the west bank. The

latter, a coastal city, is connected to Shenzhen, Hong Kong, and Zhuhai. In addition to advanced manufacturing, modern service industries such as logistics will be Huizhou's development advantages to extending the development of the chain to both ends. Therefore, these two cities have similar goals in terms of innovation-driven industrial development.

3.4 Analysis of the application of disruptive innovation-value network in the Greater Bay Area

The theory of disruptive innovation was proposed by professor Clayton Christensen at Harvard University in 1997. In the era of rapid development of new technology, it is mentioned again, mainly because of the disruptive innovation of the IoT ecosystem guided by cloud computing, massive data analysis, and artificial intelligence. Disruptive innovation allows moving toward large-scale life applications, system integration, and the development model of data analysis. It also creates a new value network for the industry and then produces the effect of paradigm-shifting.

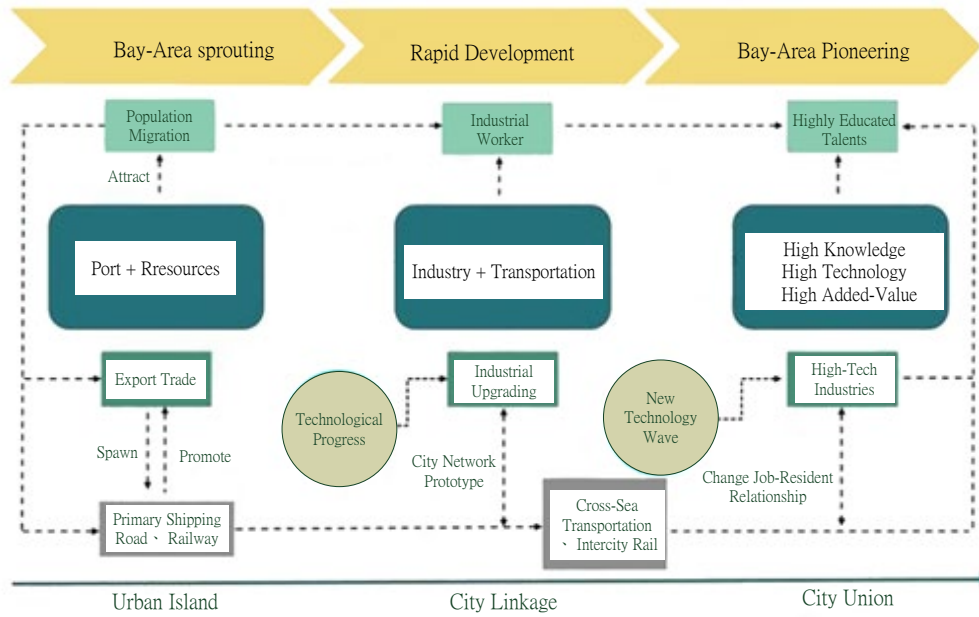
When it comes to industrial innovation theory, Schumpeter put forward the concept of innovation and established the theory of innovation. Later, the innovation development theory continued from technology, service, or product innovation to the innovative application of non-production factors such as corporate organization and culture. Today, it is applied to industrial innovation to drive regional economic development. From the perspective of innovation intensity, incremental innovation and radical innovation are needed for disruptive innovation. The former refers to the improvement and promotion of existing products, and technologies under the original technological trajectory, focusing on internal resources and relying on innovation by all employees. It has little damage to the development of enterprises and the industrial structure and has low investment risk, which is conducive to the long-term development of enterprises. However, the development of enterprises is relatively slow and the ability of industrial structure adjustment is relatively weak.

Incremental innovation is the main innovation method in traditional industries, especially in the non-modular technology field of the manufacturing industry. It has the meaning of radical innovation on the original basis. For example, breakthrough technology is usually maintenance-oriented technological innovation. Disruptive innovation is to find new value networks, usually because of relatively small scale and few resources. For example, disruptive innovation in the low-end market usually refers to innovation in business models and products.

Besides, disruptive innovation in the new market refers to innovation in terms of simplicity and price burden. Extending this concept to the area of regional innovation, cities in the emerging Greater Bay Area such as Zhaoqing and Zhuhai have inferior economic activities as cities such as Guangzhou and Foshan, meeting the standards of small scale and limited resources. If they use a continuous innovation strategy as a regional development strategy, their overall effect is inferior to other cities. On the contrary, the application of a disruptive innovation-value network may create new value and new power in these areas.

As shown in Figure. 3, from the perspective of development paths and driving factors, the development of the world's bay areas follows mostly the law of "developing cities through the ports, cities using the ports, ports relying on cities to flourish, and ports and cities complementing each other." Therefore, bay areas need to vigorously develop port-oriented industries and export-oriented economies. We find that cities in bay areas should rely on their resources and innate conveniences such as ports as their development advantages in the embryonic period.

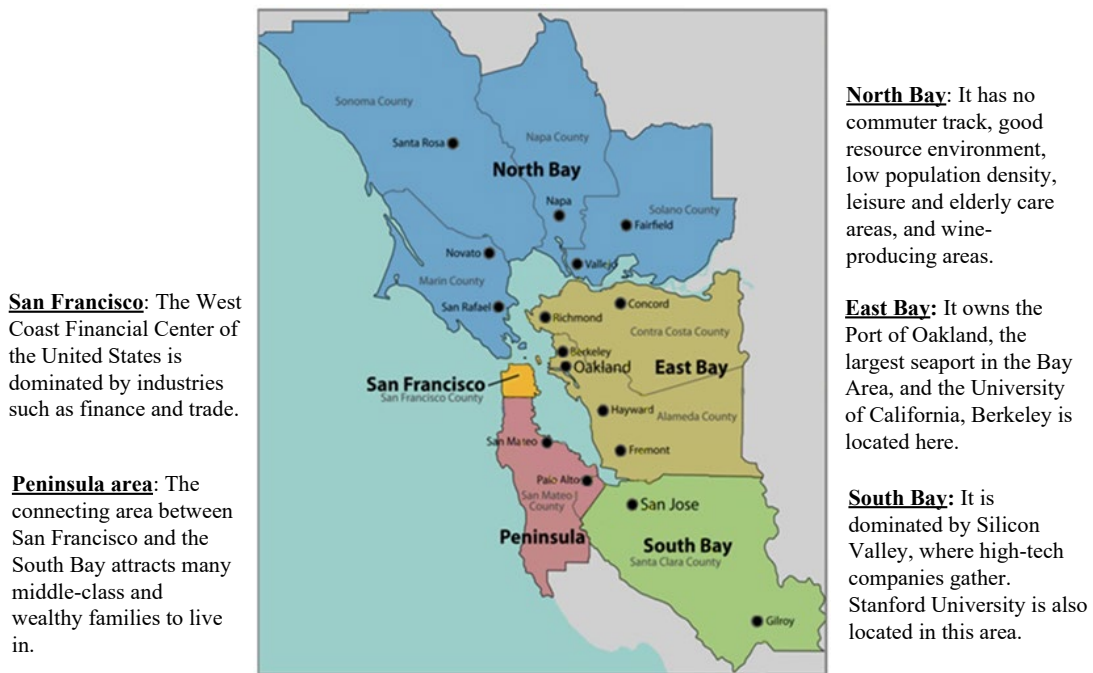
With the convenience of transportation such as cross-border transportation and technological advancement, bay area cities require various elements and resources from the neighboring cities of the bay area to form a core city. Later, the network of neighboring cities supports the economic development of the bay area with innovation trends. In addition to constructing high knowledge, high technology, and high added value and improving population quality, the cities need to have functions such as housing, life, and leisure. The inter-city development model is no longer a linked development but moves toward an integrated development model of urban competition and coordination.



Source: <https://kknews.cc/finance/8ezqy3n.html>.

Figure 3. Development path and driving factors of cities in bay areas.

The San Francisco Bay Area is known as the "Scientific Research Bay Area" (Figure. 4). The area covers an area of 18,040 km². The curved area contains six cities and nine counties. The main cities are San Francisco, Oakland, San Jose, et cetera, with a population of more than 7.6 million, making it one of the regions with the highest per capita income in the United States. According to the list of the wealthiest cities in the world released by New World Wealth in 2019, the wealth of San Francisco's Great Bay Area reached USD 2.4 trillion, ranking third among the world's wealthiest cities, second only to New York and Tokyo, and tied with London.



Source: Same as Figure. 3

Figure 4. Regional Development of the San Francisco Bay Area

San Francisco is located at the core of the bay area, with services such as finance and commerce as its primary industries. The Peninsula area is connected to the core city, attracting families of the middle-class and above. The South Bay centers in Silicon Valley and takes possession of world-renowned high-tech companies such as HP, Intel, Google, Apple, Cisco, and so on. Stanford University is also located in Santa Clara County in the South Bay Area. The school also provides Silicon Valley with a vital source of high-tech talent. In addition to having the Port of Oakland, the largest seaport in the Bay Area, the East Bay also possesses the University of California, Berkeley, and other high-end technical talents are also gathering. Therefore, the various resources in the East Bay area can provide a considerable boost to the high-tech development of Silicon Valley in the South Bay.

The North Bay refers to the San Francisco Bay Area to the north of the Golden Gate Bridge, including Marin County, Sonoma County, Napa County, Solano County, and other districts. The population density of the North Bay is the lowest in the Bay Area, the degree of industrialization is low, and the natural resources are rich. It is a main wine-producing area in California, so the primary function is a leisure residential area for retired people. In terms of regional development, the bay area not only needs to maintain the energy driven by high-tech innovation but also have a high-quality living environment. The North Bay also has a high-quality living and retains an aging workforce, allowing each region to fully play its advantages and adopt a differentiated positioning for urban industries.

Francisco City, South Bay, and East Bay of the San Francisco Bay Area have driven the regional economic development with high technology, and the high housing price raises the living cost in the Bay Area. Thus, new residents mostly move to the North Bay, making it for living, leisure, and retirement life. Similarly, Hong Kong develops financial and high-end service industries, Macau carries business, gaming, and other service industries, and Shenzhen exploits high-tech industries. Guangzhou expands information services and manufacturing and Dongguan, Foshan, and Zhongshan open up the advanced manufacturing industry in the Guangdong-Hong Kong-Macao Greater Bay Area. This seems to be learning from the development model of the San Francisco Bay Area.

To achieve disruptive growth, innovators must effectively disrupt the market. This means that in addition to understanding the innovator's human, technical, organizational, financial, and other resources, innovators must also understand whether they have the potential to disrupt the market. The value network of disruptive innovation lies in not advancing along with the original market but cutting in from low-end markets and new markets. The value positioning of disruptive innovation lies in the essence of simplicity, practicality, convenience, and low cost. Innovators form new competitive advantages by rebuilding or restructuring the value network. After gaining a firm foothold in the market, they start continuous innovation and gradually become one of the mainstream cities. In addition to economic and industrial innovation, there must also be corresponding execution power, such as the setting of industrial development environmental regulations and supporting strategies.

Therefore, we realize that cities in the bay areas must make good use of the advantages of different cities in the area. For example, the Greater Bay Area can apply the Greater Bay Area awareness and standards to set up a business environment that is legalized, internationalized, and convenient surroundings. It must be including of "six low-level" costs of business operation such as taxes, logistics, financing, land, land and real estate, labor supply, and government communication. Moreover, the Greater Bay Area should make good use of its positioning as a green agricultural product distribution center and create a "central kitchen" serving the cities in the Bay Area. It may link to the biological medicine industry in Zhuhai and Guangzhou and develop characteristic industries of health, medical beauty, travel industry, and so on. Thus, the cities become a model of good-quality life and livable and appropriate for industries and tourism. In this way, they gain a foothold in the market and gradually exert their potential to disrupt the market. From this perspective, the Guangdong-Hong Kong-Macao Greater Bay Area needs to make full use of the advantages of Guangdong, Hong Kong, and Macao to promote the development of industries in the Bay Area. The goal is to enhance technological innovation in the Pearl River Delta, Hong Kong, and Macao, as well as industrial synergistic competition and in-depth cooperation.

4. Conclusions

In business management, "disruptive" innovation refers to companies with fewer resources and smaller scales that successfully challenge deeply-rooted companies. In the competition and cooperation of cities, it refers to the path through which rising cities replace mainstream cities. For example, the Guangdong-Hong Kong-Macao Greater Bay Area is positioned to become the most active and innovative bay area in the global market. When cities in the Greater Bay Area pursue the integration of management and enterprise innovation and emphasize the development of collaborative innovation, it is important to know that talents are the most active and necessary factor in innovation activities. The Greater Bay Area has introduced innovative and entrepreneurial teams covering industries such as health, medicine, and high-end equipment manufacturing, which has effectively promoted the high-quality development of the regional economy and society. However, for the established scientific research personnel covering high,

middle, and lower levels, the Greater Bay Area also needs to provide three major functions of production, living, and ecology, and even further develop into a nationwide area suitable for living, working, and traveling.

At present, the Guangdong-Hong Kong-Macao Greater Bay Area is constructing cities that fully reflects the new development concept, striving to realize the integration of production, life, and ecology in the new era. More effort is necessary for the construction of the industrial ecosystem and strive to build a demonstrative area that organically integrates high-quality development and high-quality life. It is required to undertake the industries that overflowed from the cities of the Greater Bay Area and develop into the most advanced ecological circle of health and other industries. Therefore, we suggest that it should promote the innovation of the scientific and technological, management, and business model at the industrial and enterprise levels through the innovation of the system, policy, and work. The vitality of the market and social subjects are needed with a whole set of more perfect and effective policy mechanisms. The objective is to make the industrial ecosystem become an important carrier to practice the new development concept, a key region to drive economic growth, and strong support to promote industrial upgrading.

In addition, creating a niche of disruptive innovation and development demands the responsibility of industrial ecological construction by leading enterprises. This is mainly because leading enterprises have a large amount of industrial data and have the natural advantage of self-subversive development. Moreover, leading enterprises own a large number of human resources, materials, capital, and other resources in the industrial chain, enabling them to realize self-evolution through data transformation or to form industrial chain clusters through investment, mergers, and other extensional development methods. In this way, it may realize collaborative cooperation, build a new industrial carrier, and achieve ecological expansion in the Greater Bay Area.

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