

Digital economy development in a less-developed coastal city: a case study in Shanwei, Guangdong, China

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749

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Abstract

Purpose – This paper provides a detailed case analysis of Shanwei, a developing coastal city in Guangdong Province, to examine the growth of its digital economy.

Design/methodology/approach – It first introduces Shanwei's factor endowments and summarizes its achievements within the digital sector. Second, it measures the extent of Shanwei's digital industry's advancement in three metrics: digital economy index, attention to the digital economy and innovation and entrepreneurship level in the digital sector and compares it with neighboring cities.

Findings – The results indicate that Shanwei has actively promoted the growth of its digital economy since 2022, achieving economic growth via project introduction, high-tech and industrial park construction and industrial digital transformation. In 2024, projects such as constructing an intelligent computing center and an underwater data center were initiated to deepen the market-oriented reform of data elements. However, Shanwei's digital economy level is generally lower than that of neighboring cities, with a significant gap compared to Shenzhen. Its attention to the digital economy is rising but still lags behind neighboring cities. Shanwei's digital industry innovation and entrepreneurship have developed rapidly, and it is next to Shenzhen, Huizhou and Shantou in 2020.

Practical implications – This paper proposes digital technology innovations, infrastructure construction, manufacturing digitalization and legislation to boost Shanwei's digital economy.

Originality/value – This study addresses a research gap by showing how a resource-limited coastal city, Shanwei, develops its digital economy. It evaluates Shanwei's digital process using three indicators and compares it with neighboring cities, which reveals each city's strengths and weaknesses and enriches regional digitalization research. The findings also offer valuable insights for other less developed coastal cities.

Keywords Digital economy, Less developed coastal city, Regional comparison

Paper type Research paper

1. Introduction

The digital economy involves economic endeavors that utilize data as a fundamental resource for production, employ networks, and leverage information and communication technologies (ICT) to facilitate production efficiency and enhance the economic structure (Zhang *et al.*, 2021; Soyulu *et al.*, 2023). The “14th Five-Year Plan for Digital Economy Development” outlines the tasks, key schemes, and supporting measures for the progress of the digital sector within China, giving guidance for various regions and departments to advance the digital economy (Shi, 2022). Guangdong, as a leading province in the digital industry, reached a digital economy scale of 6.90 trillion RMB in 2023. It maintained the top position in growth trends and scale nationwide for five consecutive years from 2018 to 2023 (Guo and You, 2024). In 2021, the “Guangdong Province Digital Economy Promotion Regulations” were enacted to address institutional and systemic obstacles by using the legislative approach to expand the digital economy.

JEL Classification — R11

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In the interest of transparency, data sharing, and reproducibility, the author(s) of this article have made the data underlying their research openly available. It can be accessed by following the link here:

Wang *et al.* (2025), “Digital Economy Development in a less developed coastal city: a Case study in Shanwei, Guangdong, China”, Mendeley Data, V3, doi: 10.17632/zffzsvvpkk.3.



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Shanwei City is a less developed area situated on the eastern shore of Guangdong province, near the economically developed Greater Bay Area (Lou *et al.*, 2015). It spans 5,271 square kilometers, and its resident population in 2023 is approximately 2.69 million. In 2024, Shanwei's GDP grew 4.0% to 150.089 billion yuan. The primary, secondary, and tertiary industries contributed 20.58, 43.36, and 86.15 billion yuan, respectively.

Shanwei focuses on strengthening the real economy and accelerating the development of a modern industrial system featuring strong primary, secondary, and tertiary sectors, along with marine and digital economies. Particularly, regarding marine economy, seven marine ranching projects were launched and financed with 1.2 billion yuan in 2024, and 11 additional projects worth 5 billion yuan were reserved, creating a complete industrial chain that connects everything from seed development and research to equipment, farming, processing, cold storage, and even fishing tourism. In rural industries, Shanwei prioritizes six major agricultural products, which are sweet potatoes, rice, lychees, pigs, plums, and tea. It also cultivates specialties such as oysters and pineapples, establishing a unique agricultural system. In manufacturing, the electronic information industry is being reinforced, and the offshore wind power equipment chain is steadily improving. Enterprises such as Titan Wind and PowerChina have begun production, while major projects by BYD and other automotive firms are underway. Shanwei also promotes tourism, including coastal and cultural tourism, to stimulate consumption and drive economic growth. Therefore, Shanwei has made notable strides in developing its marine, agricultural, manufacturing, and tourism industries.

Besides, the development of its digital economy enhances these industries. First, in the Houlake wind-fishery integration project in Lufeng County, Shanwei, intelligent aquaculture facilities have been installed, including automatic feeding, water quality monitoring, and surface surveillance systems. Second, at the Miao Li Modern Agricultural Park in Chikeng Town, Haifeng County, drones are used for precise pesticide spraying, and intelligent weeding robots efficiently handle weed control. An environmental sensing network composed of soil monitoring stations and cameras transmits key parameters such as temperature, humidity, and light to a central control system, providing data support for agricultural decision-making. Third, Shanwei Tianmao New Energy Technology Co., Ltd., located in the Shanwei High-Tech Zone, has established a highly automated production line, where various machines for mixing, coating, packaging, and formation work in coordination within the workshop. Last, the smart cultural and tourism platform has been launched, offering intelligent travel services, including information on Shanwei's tourism resources, travel routes, and scenic spots.

To develop Shanwei's digital economy, "Shanwei City Implementation Plan for Promoting Digital Economy Development" was enacted in 2022. On one hand, Shanwei facilitates digital industrialization by actively developing core industries such as 5G, big data, and ultra-high-definition video. On the other hand, it accelerates industrial digitalization by building the industrial internet and establishing benchmark enterprises such as Truly Opto-Electronics, Honghai Bay Power Plant, and Baolihua New Energy. Additionally, it speeds up the digital transformation of service in areas including smart finance, smart culture and tourism, smart eldercare, smart education, and smart healthcare.

To sum up, Shanwei represents a typical case of a less developed coastal city striving for high-quality economic development through industrial upgrading and digital transformation, as well as integrating the digital economy with traditional industries. It is valuable to explore how the digital economy is developing in Shanwei. How does its progress compare with neighboring cities? What policies can be enacted to promote Shanwei's digital economy? To answer these research questions is vital for understanding the prospects and challenges of digital economic development in less-developed cities within China's broader push for regional coordination and high-quality growth.

The objective of this paper is to implement an in-depth case study of Shanwei's digital economy and put forward some specific suggestions for its development. The rest of the study is outlined below: The second section reviews the recent and relevant papers within the digital economy field. The third section introduces three metrics to assess the maturity of digital

economic activities in Shanwei, the Shantou-Jieyang-Chaozhou metropolitan area, and Shenzhen and Huizhou in the Greater Bay area, including the extent of the digital sector's advancement, the attention to the information sector, and the degree of digital industry's innovation and entrepreneurship development, for a comparison purpose. The data source is documented. The fourth section presents Shanwei's endowment of resources to develop the digital sector and describes its current state of the digital industry based on local daily reports and the Government Work Report from 2022 to 2024, as well as empirical results regarding Shanwei's digital economy development based on three measurements. The conclusion part outlines the results and presents policy proposals accordingly.

2. Literature review

Digital technologies enhance citizens' lives, boost productivity, and help governments deliver essential services (Miethlich *et al.*, 2020), which underscores the significance of the digital sector for less developed countries (Sturgeon, 2021) and regions (Reynolds *et al.*, 2021). Previous studies concentrated on the following aspects: regional disparities in the Internet economy, innovation and entrepreneurship in the digital sector, and digital transformation in less developed regions.

First, regional variations exist in the Internet economy's development levels (Sidorov and Senchenko, 2020). For instance, in developed countries, digital technology use is more advanced, covering postal services, banking, and information search, while in developing countries, this digital culture is still emerging (Kolesnikov *et al.*, 2020). Luo and Zhou (2022) demonstrate that the web economy thrived in the East but fell short in China's midwestern provinces and autonomous areas. To sum up, these references establish the theoretical foundation in regional development imbalance theory (Dawkins, 2003) to conduct a comparative assessment of Shanwei and its neighboring cities.

Second, innovation and entrepreneurship have become prominent roles in the tech-driven economy (Wang *et al.*, 2022). For one thing, innovation occurs in the goods or services that firms provide and in their approaches to delivering and marketing them (Sorescu and Schreier, 2021). For instance, Bernitter *et al.* (2021) conduct an experimental study on location-based mobile marketing in customer acquisition. They found that its success depends on the strategic combination of geographical position, behavior-based marketing, and the type of promotion offered. For the other thing, entrepreneurship in the digital age, which uses emerging information solutions to digitally transform ongoing enterprises and create new entities (Herman, 2022), has gained increasing attention in theoretical and empirical research (Beliaeva *et al.*, 2020). For instance, Wang and Shao (2023) find that the information economy promotes energy efficiency, and entrepreneurship mediates this relationship. Hence, these references build the theoretical basis in regional innovation systems theory (Asheim *et al.*, 2011) to examine how firms in Shanwei adopt innovative products, services, and marketing methods, which reveals the pace of its digital economy development.

Third, digital transformation, in terms of adopting digital technologies to change business and industrial procedures, is functional to release traditional development constraints in regions (Plekhanov *et al.*, 2023). Turgel *et al.* (2022) argue that the digitalization of industry is fundamental to developing regional economic systems, involving integrating advanced information and communication technologies into enterprise operations. Zhao *et al.* (2021) claim a collaborative connection between China's technological shift and its economic development in provinces. Unlike the active promotion of the digital industry advancement in Shanwei City, the literature documents Shanwei as a less developed region with an underdeveloped digital economy. For instance, Ma *et al.* (2023) report that the Greater Bay Area's digital sector has advanced significantly further than Guangdong's eastern, western, and northern areas. Shenzhen led the way, while Shanwei lagged, making it the least developed city in this regard. Deng *et al.* (2024) detect the information economy's positive spatial influence on revitalizing the Guangdong countryside. Lin *et al.* (2024) document that the developmental extent of Shanwei's digital economy was lower than that of other cities in the eastern wing of Guangdong, such as Jieyang, Shantou, and Chaozhou, from 2011 to 2019.

However, these papers do not describe Shanwei’s recent digital economy, update its new achievements, or report any policy and legislation backup. This hinders an objective reflection of Shanwei’s digital economy progress and its social and economic outcomes.

This research builds on existing literature highlighting imbalances in the digital economy across regions by offering in-depth insights into Shanwei’s digital economy progress. The present paper fills a gap in case-study research to illustrate how a small, resource-constrained, and coastal city builds a digital economy. Second, three measures are applied to assess the developmental grade of the digital economy of Shanwei and compare them with its neighboring cities, highlighting their respective strengths and weaknesses, thus enriching the expanding research on cross-city comparison in terms of regional digitalization. Third, Shanwei’s experience promoting the digital economy can be a reference for other less developed and coastal cities.

3. Materials and methods

The research questions are: What is the current developmental status of Shanwei’s digital economy? How does Shanwei’s digital economy compare with neighboring cities, such as Shenzhen, Huizhou, and the Shantou-Jieyang-Chaozhou metropolitan area? What policy interventions can effectively promote Shanwei’s digital economy? Hence, the objective is to conduct an in-depth, metrics-driven case analysis of Shanwei’s digital economy and formulate concrete, context-specific policy recommendations based on that empirical assessment.

3.1 Assessment of digital economy maturity

Based on Zhao *et al.* (2022) and considering data availability and completeness, the digital economy developmental index is constructed by five indicators, such as the extent of Internet access and usage, the count of individuals and businesses engaged in Internet-related activities, the economic output generated by the Internet sector, the level of mobile phone ownership and usage, and the degree to which digital finance services are accessible to the population. They are respectively measured by the count of high-speed Internet subscribers per hundred persons, the share of workers in the information technology and software among municipal units’ workers, the total volume of telecommunications services on a per capita basis, the count of cell phone owners per hundred persons, and the index for digital inclusive finance. See details in Table 1.

Table 1. Digital economy developmental index framework

First-level indicators	Second-level indicators	Third-level indicators	Indicator attributes	Weight
Comprehensive Digital Economy Development Index	Internet penetration rate	The count of broadband Internet subscribers for every hundred individuals	+	0.224
	Internet-related practitioners	The percentage of urban workforce employees engaged in the computer services and software sector	+	0.111
	Internet-related output	The total volume of telecommunications services on a per capita basis	+	0.342
	Mobile phone penetration rate	The number of mobile phone users per hundred people	+	0.267
	Digital inclusive finance	Inclusive Digital Finance Index	+	0.056

Note(s): The Digital Inclusive Finance Index is provided by the Digital Finance Research Center of Peking University. The remaining indicators are obtained from the “China Urban Statistical Yearbook”

Source(s): Author’s own work

The entropy approach is utilized to build this index for Shanwei and its neighboring cities. The detailed calculation process is outlined below: Step one is to standardize the processing of indicators. If there are k prefecture-level cities, n years, and m indicators, then the value of the j_{th} indicator in the i_{th} year of the a_{th} prefecture-level city is Y_{aij} ($a = 1, 2, \dots, k; i = 1, 2, \dots, n; j = 1, 2, \dots, m$). The dimensional difference is eliminated by using the range method, and the index value is normalized to the interval of $[0,1]$. The standardization processes of positive indicators and negative indicators are shown in Equations (1) and (2), respectively.

$$X_{aij} = \frac{Y_{aij} - Y_{min}}{Y_{max} - Y_{min}} \quad (1)$$

$$X_{aij} = \frac{Y_{max} - Y_{aij}}{Y_{max} - Y_{min}} \quad (2)$$

Step two is to compute the weight P_{aij} of the j_{th} indicator of the a_{th} prefecture-level city in the i_{th} year.

$$P_{aij} = \frac{X_{aij}}{\sum_{a=1}^k \sum_{i=1}^n X_{aij}} \quad (3)$$

The third to fifth steps are respectively to compute the information entropy e_j of the j_{th} indicator, the information utility value g_j , and the weight W_j of the j_{th} indicator.

$$e_j = -\frac{1}{\ln(k \times n)} \sum_{a=1}^k \sum_{i=1}^n (P_{aij} \ln P_{aij}) \quad (4)$$

$$g_j = 1 - e_j \quad (5)$$

$$W_j = \frac{g_j}{\sum_{i=1}^n g_j} \quad (6)$$

The final step is to calculate the digital economy index H_{ai} of City a in the i_{th} year. The digital economy developmental index ranges from 0 to 1, with higher values signifying a more advanced level of digital sector advancement.

$$H_{ai} = \sum_{j=1}^m W_j \times X_{aij} \quad (7)$$

3.2 Assessment of attention to the digital sector

Referring to Li *et al.* (2022), the present paper obtains the search attention degree and continuous changes of the keyword “digital economy” by Internet users in Shanwei and its neighboring prefecture-level cities during 2018–2024 from the Baidu Index and measures each city’s development degree of the digital economy annually, with higher values reflecting more attention to the digital sector.

Drawing from the online search activity of users on Baidu, keywords are used as the fundamental units for statistical analysis, and keyword frequencies are computationally weighted. The search index is divided into PC and mobile indices based on data sources. The Baidu Index website is accessible at https://index.baidu.com/v2/index.html#.

3.3 Measurement of the innovation and Entrepreneurship Index for the fundamental sectors of the digital economy

Serving as the cornerstone of the information sector, the innovation and entrepreneurial efforts within the fundamental sectors of the digital economy explore new business opportunities,

continually discover new technologies, invent new products, and enhance total factor productivity, merging the digital sector with the conventional industry. Referencing the method of Dai *et al.* (2022), the Innovation and Entrepreneurship Index for the core industries of the information economy in Shanwei and surrounding areas is taken from the Enterprise Big Data Research Center at Peking University during 2011–2020, which is publicly downloadable. This index comprises eight indicators across six dimensions: enterprise creation, foreign investment, venture capital, patents, trademarks, and software copyrights. Each indicator is standardized and assigned a fixed weight. The weighted average calculation is carried out further. The evaluation system of this index and the weight of each sub-indicator are shown in Table 2.

3.4 Data sources

The data introducing the overview of the digital sector expansion in Shanwei City in 2022–2024 comes from the Shanwei Daily and the Shanwei Municipal Government Work Report. The data to assess the digital industry maturity originates from the China City Statistical Yearbook. The data used to gauge attention to the digital economy is obtained from the Baidu Search Index. The data assessing the extent of the digital industry innovation and entrepreneurship is sourced from enterprise big data compiled by the Peking University Enterprise Big Data Research Center.

4. Results

4.1 Digital economy resources endowment in Shanwei

Geographically, Shanwei is bordered by Greater Bay Area cities, such as Shenzhen and Huizhou to the left and the Shantou-Jieyang-Chaozhou metropolitan area to the right.

Table 2. Innovation and entrepreneurship index

First-level indicators	Second-level indicators	Third-level indicators	Indicator attributes	Weight
Innovation and Entrepreneurship Index	The number of newly established enterprises	The number of newly registered enterprises	+	20.00%
		The number of new investments made by foreign legal persons	+	15.00%
	Attract foreign investment	The number of enterprises with newly added venture capital	+	25.00%
	Attract venture capital	The number of newly authorized invention patents	+	12.50%
		The number of newly disclosed utility model patents	+	5.00%
		The number of newly disclosed design patents has increased	+	2.50%
		The number of newly registered trademarks	+	10.00%
	The number of trademark registrations	The number of newly registered software copyrights	+	10.00%

Source(s): The Innovation and Entrepreneurship Index for Shanwei and nearby areas’ core digital industries is sourced from Peking University’s Enterprise Big Data Research Center. It can be downloaded at <https://opendata.pku.edu.cn/file.xhtml?fileId=12533&version=4.1>

Strategically, it is designated as a meaningful pivot on the east coast of Guangdong Province in China. Its important geographical location is shown in [Figure 1](#).

Shanwei's resource endowments are beneficial to the advancement of its digital economy. First, Shanwei City has a rich cultural heritage. Known as the "Hometown of Chinese Folk Culture and Art," Shanwei has abundant tourism resources and natural and cultural materials, which benefit the digital creative industry. Second, digital infrastructure is accelerating. By the end of 2023, Shanwei Telecom and Unicom had jointly built 1,653 5G base stations, while Shanwei Mobile and Radio and Television had built 2,631 5G base stations, enhancing network coverage and quality. The count of customers utilizing fixed broadband services reached 788,000, fiber optic access users reached 780,000, 5G users reached 1.204 million, and telecom business revenue reached 2.23 billion yuan. Third, there are substantial policy benefits. Shanwei has significant potential for land development, with abundant resources for new industrial land and standard factory buildings, offering a new avenue for the expansion of the Greater Bay Area ([Weng et al., 2020](#)). Fourth, it has a distinct geographical advantage. Shanwei is adjacent to the Pearl River Delta, which has convenient transportation and forms a half-hour to one-hour living circle with Shenzhen and Guangzhou ([Zhang et al., 2018](#)). Fifth, the talent policies are attractive. The implementation of the "Shanwei Talent Development Promotion Regulations" in May 2023 has enhanced the legalization of regional talent work. The release of the Shanwei Talent Plan in November 2023 created a solid social atmosphere for recognizing, valuing, respecting, and utilizing talent, aiding in the expansion of Shanwei's digital sector.

4.2 The development overview of Shanwei's digital economy from 2022 to 2024

The routes for growing the digital sector usually include digital industrialization and industry digitization ([Xu and Xu, 2023](#)). According to Shanwei Daily, in 2022, Shanwei made

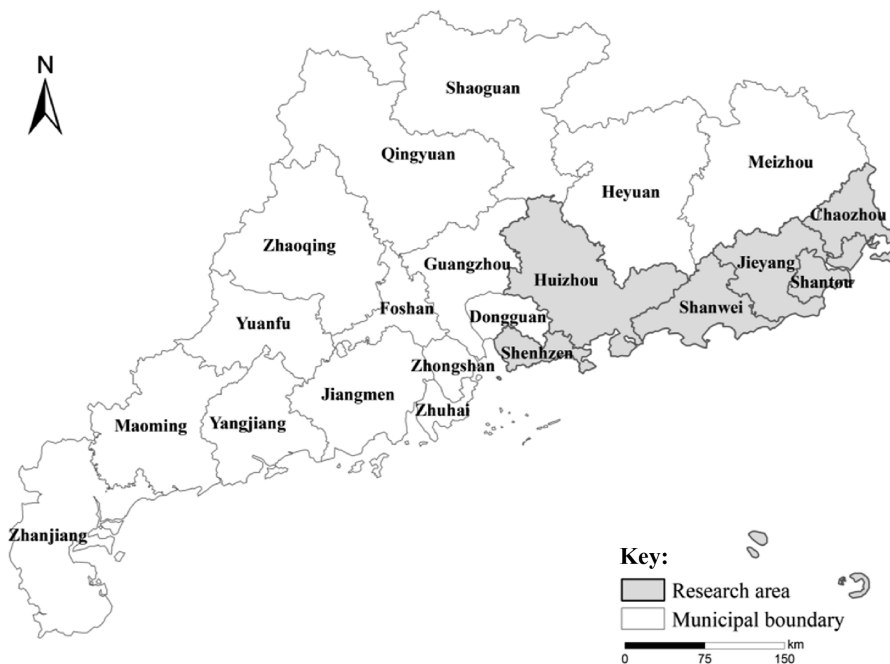


Figure 1. Shanwei and its neighboring cities. **Source:** Author's own work

significant efforts in digital industrialization, successfully attracting 26 projects with an aggregate investment of 10.9 billion yuan, raising the information economy’s proportion of GDP to 7.3%. Shanwei established a 5G industrial cluster, promoted key technological breakthroughs by leading digital companies, and achieved revenue of 2.76 billion yuan. Meanwhile, Shanwei accelerated industrial digitization, creating model enterprises for the industrial internet and promoting digital transformation in 110 industrial enterprises. Using cross-border e-commerce platforms, the city achieved export revenues of 1.415 billion yuan. Meanwhile, it actively constructed digital platforms. This process also accelerated the digital shift of service trades, for example, innovative finance, culture and tourism, health and wellness, education, and healthcare, injecting new vitality into various fields.

According to the Shanwei Municipal Government Work Report of January 2024, in 2023, Shanwei achieved an output value of over 25 billion yuan in the electronic information industry, over 20 billion yuan in the new energy vehicle industry, over 15 billion yuan in the power energy industry, and over 13 billion yuan in the marine engineering equipment manufacturing industry. The incremental value generated through advanced manufacturing processes and technologies constituted 32.2% of the value added by large enterprises. The value generated by the core digital sector is projected to make up 8.0% of GDP.

In 2024, both internal and external environments will support the progress of Shanwei’s digital economy. For instance, in March 2024, a team led by the head of Alibaba Cloud’s South China Guangdong-Dongguan-Huizhou region and representatives from Suihong Huachuang Group’s Hongxin Electronics Group visited Shanwei for discussions. They negotiated the construction of the Shanwei Intelligent Computing Center for the Greater Bay Area, seeking to effectively leverage Shanwei’s abundant clean energy resources, such as wind and solar power. The goal is to transition from green electricity to green computing and further to AI applications, ensuring that high-performance computing power meets the rapidly growing demand for massive application scenarios. In April 2024, Shanwei’s external office actively promoted the growth of Shanwei’s digital economy sector. Guangdong Radio and Television Network Shanwei Branch, Henuo Digital Industrial Park, and Shenzhen Hailan Cloud Data Center Technology Co., Ltd. held a strategic cooperation agreement signing ceremony and event in Shanwei. The three parties are committed to advancing the first underwater data center project in the Greater Bay Area, supporting Shanwei’s goal to be a solid maritime city, and achieving high-quality digital economy development. In June 2024, the Shanwei Municipal Government Service and Data Management Bureau held a Party Group Theoretical Study Center meeting, where they discussed deepening consumer-driven reforms of data elements and further supporting the digital industries. Specific measures include advancing data resource cataloging and linking work, launching public data open empowerment actions, and strengthening cooperation with Guangzhou and Shenzhen to establish trading service bases.

4.3 Empirical analysis of Shanwei’s digital economy

4.3.1 Digital economy level. Table 1 displays the weights assigned to each component of the digital economy index. Specifically, Internet-related output carries a weight of 0.342, the Internet penetration rate has a weight of 0.224, and Internet-related practitioners account for 0.111. Meanwhile, the mobile phone penetration rate is allocated a weight of 0.267, and digital inclusive finance is given a weight of 0.056.

As detailed in Table 3 and Figure 2, the results show that Shanwei’s average digital economy level was 0.062, lower than that of neighboring cities from 2011 to 2019. The difference between the Shan-Jie-Chao metropolitan area (Jieyang, Shantou, and Chaozhou) and Shanwei was relatively small, but there was a notable gap compared to Greater Bay Area cities, especially Shenzhen (0.670).

4.3.2 Attention to the digital economy. As evidenced by Table 4 and Figure 3. The starting year of 2018 was chosen because the “digital economy” was only included in the Baidu Index in the middle of 2017. The results show that Shanwei City’s attention to the digital economy

Table 3. Digital economy level of Shanwei and neighboring Areas (2011–2019)

City	2011	2012	2013	2014	2015	2016	2017	2018	2019
Shenzhen	0.642	0.745	0.707	0.807	0.704	0.661	0.570	0.635	0.563
Huizhou	0.077	0.105	0.128	0.140	0.145	0.154	0.172	0.179	0.186
Shanwei	0.025	0.037	0.0428	0.056	0.067	0.062	0.082	0.092	0.095
Jieyang	0.033	0.046	0.056	0.062	0.067	0.073	0.097	0.149	0.196
Shantou	0.067	0.068	0.087	0.079	0.087	0.090	0.102	0.106	0.120
Chaozhou	0.067	0.082	0.082	0.227	0.084	0.093	0.096	0.115	0.118

Note(s): The entropy approach is utilized to build this index for Shanwei and its neighboring cities. It ranges from 0 to 1, with higher values signifying a more advanced level of digital sector advancement

Source(s): Author's own work

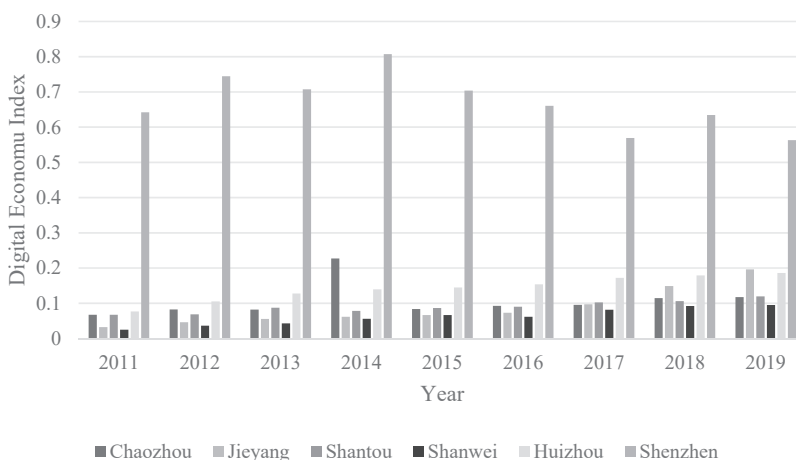


Figure 2. The Digital Economy trend of Shanwei and Neighboring Cities from 2011 to 2019. **Source:** Author's own work

Table 4. Attention Level to the information economy in Shanwei and neighboring areas (2018–2024)

City	2018	2019	2020	2021	2022	2023	2024
Shenzhen	102	131	145	167	244	212	154
Huizhou	12	16	33	52	85	73	54
Shanwei	2	2	8	8	28	17	17
Jieyang	4	5	16	22	51	44	26
Shantou	15	15	42	43	99	81	49
Chaozhou	3	2	12	14	36	18	14

Note(s): The Baidu Index is used to measure public attention to digital industries in Shanwei and nearby cities (2018–2024), with average annual search values for terms such as “digital economy” indicating the level of regional engagement

Source(s): Author's own work

has generally increased from 2018 (2) to 2022 (28) and dropped to 17 in 2023–2024, which remains lower than surrounding cities. The gap with Chaozhou is not significant, the gap with Shenzhen is remarkably consistent, and the difference with Huizhou, Shantou, and Jieyang in 2024 becomes smaller.

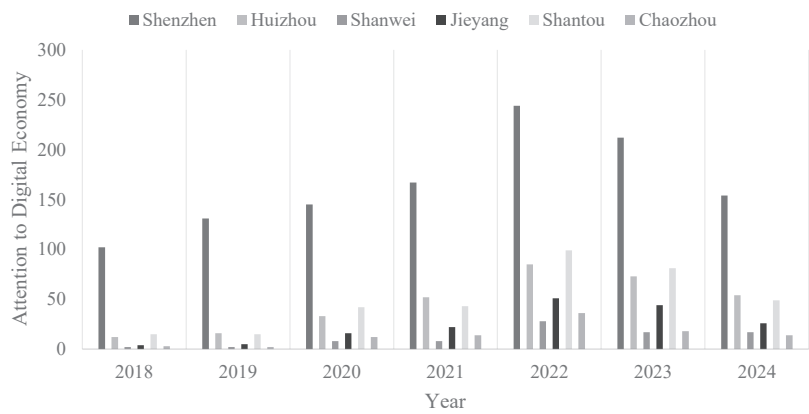


Figure 3. The trend of attention to the digital sector in Shanwei and neighboring Cities from 2018 to 2024.
Source: Author’s own work

4.3.3 *Innovation and entrepreneurship Index for the fundamental sectors of the digital economy.* Details are provided in Table 5 and Figure 4. A higher value indicates a greater intensity of innovation and entrepreneurial activity within the information sector. The findings indicate that the grade of innovation and entrepreneurship in Shanwei’s digital sector has risen from 2011 to 2020. During 2011–2014, the index was low and below that of all surrounding cities. Since 2015, there has been a noticeable improvement in Shanwei, with performance better than Jieyang and Chaozhou in 2015, 2016, 2017, and 2020, but still lagging behind the Greater Bay Area cities and Shantou.

4.3.4 *Possible reasons leading to the differences in digital economy growth between Shanwei and surrounding cities.* Firstly, Shanwei has fewer 5G base stations than other cities. In 2023, Shanwei had about 4,284 5G base stations, which is lower than Jieyang (5,174 stations) and Shantou (10,000 stations), and significantly lower than Huizhou (14,862 stations) and Shenzhen (75,000 stations). Less digital infrastructure may slow digital economy growth because digital infrastructure contributes positively on employment in the services sector (Ndubuisi *et al.*, 2021), and is an essential driver of high-quality and sustainable economic development in terms of fostering technological advancement, enhancing the allocation of production factors, and enabling economies of scale (Tang and Zhao, 2023), as well as improving corporate investment efficiency (Wang *et al.*, 2025).

Secondly, according to the 2023 Research Report on the Digital Transformation of Enterprises in Shanwei City, enterprises in advanced manufacturing and new energy sectors in

Table 5. Innovation and Entrepreneurship Index for the Fundamental Sectors of the Information Economy in Shanwei and neighboring areas (2011–2020)

City	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Shenzhen	99.16	99.57	99.73	99.84	99.95	99.97	100.00	99.92	99.86	99.89
Huizhou	82.71	78.54	83.74	87.47	87.85	88.93	92.37	91.37	93.05	94.05
Shanwei	1.60	2.30	4.84	21.65	46.10	39.10	46.56	47.46	51.95	61.12
Jieyang	30.90	16.13	14.10	24.51	23.35	36.63	44.53	51.43	57.52	57.47
Shantou	69.07	41.04	42.21	47.67	65.42	64.15	71.32	70.27	74.86	79.95
Chaozhou	20.05	18.56	18.15	29.84	21.54	34.66	30.14	32.41	50.08	51.38

Note(s): This index is provided by the Enterprise Big Data Research Center at Peking University
Source(s): Author’s own work

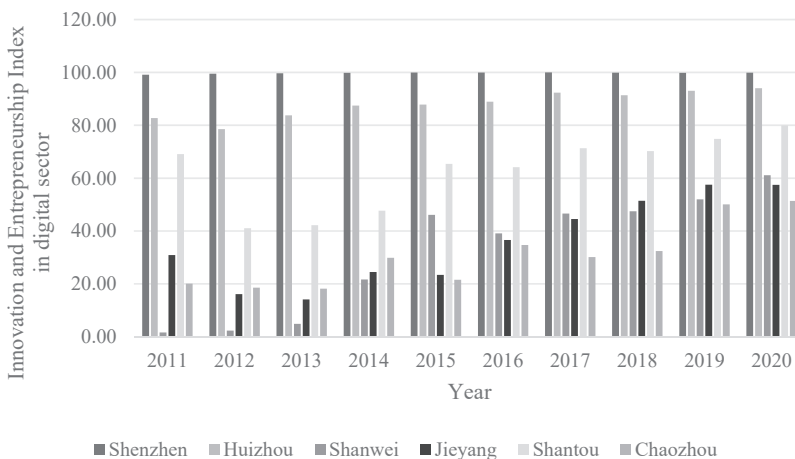


Figure 4. The trend of the Innovation and Entrepreneurship Index for the Fundamental Sectors of the Information Economy in Shanwei and neighboring Cities (2011–2020). **Source:** Author's own work

Shanwei still face common problems, such as insufficient motivation for digital transformation, high investment costs for technological improvement, and obstacles to data interconnection and interoperability. In addition, some enterprises also have individual problems, such as insufficient autonomy in digital development, a shortage of digital talents, concerns about data security issues, and a lack of interconnection and interoperability within the modularization of internal business.

Thirdly, cities with more advanced digital economy development, such as Shenzhen and Shantou, have not only issued policy guidelines to support local digital economic growth but have also enacted specific regulations to legally safeguard their development. These regulations cover infrastructure, digital elements, core digital industries, industrial digitalization empowerment, digital governance, and various enabling factors. Additionally, these cities emphasize risk prevention in aspects such as industrial chain security and digital financial security. Hence, these regulations also include policy measures for promoting digital economic development in the fields of government services, finance, taxation, talent, technological innovation, intellectual property, land supply, electricity access, and facility protection. Disciplinary mechanisms are established for government departments that fail to fulfill their responsibilities in promoting the digital economy. Although Shanwei, Jieyang, and Chaozhou have also introduced supportive policies for digital economic development, they have not yet passed dedicated legislation, see details in [Table 6](#). Therefore, cities with such promotional regulations seem to have advantages in developing the digital economy because global experience indicates that digital economy frameworks with legal regulations are more likely to achieve economic growth, enhance productivity, and open up opportunities for new industries ([Frolov and Lavrentyeva, 2019](#); [Rudyk et al., 2022](#)).

5. Conclusion

This study presents a case study of Shanwei's digital economy. It utilizes public data and policies enacted to assess the current state of Shanwei's digital economy and quantitatively compares it with neighboring cities. The results show that since 2022, Shanwei has actively promoted the expansion of the digital sector via two main approaches: digital industrialization and industry digitization, which include introducing projects, building industrial parks, increasing revenue in the information technology services industry, and advancing the digital

Table 6. Digital economy policies and laws in Shanwei and its surrounding cities

City	Policies and legal regulations	Year
Shantou	Regulations on Promoting Digital Economy in Shantou Special Economic Zone (Policy) The “14th Five-Year Plan” for the Informatization Development of Shantou City (Legal regulation)	2023 2023
Jieyang	Implementation Plan for the Digital Transformation of the Manufacturing Industry in Jieyang (2021–2025) (Policy)	2021
Chaozhou	Implementation Plan for the Digital Transformation of the Manufacturing Industry in Chaozhou (2023–2025) (Policy)	2023
Shanwei	Implementation Plan for Promoting Digital Economy Development in Shanwei(Policy)	2022
Shenzhen	Implementation Plan for the Innovative Development of the Digital Economy Industry in Shenzhen (2021–2023) (Policy) Regulations on Promoting the Digital Economy Industry in the Shenzhen Special Economic Zone (Legal regulation)	2021 2022
Huizhou	Several Measures of Huizhou City to Promote the Development of the Digital Economy Industry(Policy) Several Policies for the High-Quality Development of Huizhou’s Digital Industry Base (Policy)	2021 2024

Source(s): Author’s own work

transition of industrial enterprises. In 2023, Shanwei achieved significant growth in the output value of its electronic information, new energy vehicles, power energy, and marine equipment manufacturing industries, with the value added by core digital economy industries rising to 8.0% of GDP. In 2024, Shanwei continues to optimize the digital economy development environment by collaborating on projects such as the Shanwei Intelligent Computing Center and the Undersea Data Center, deepening consumer-driven data reforms, and further advancing the digital sector.

In addition, between 2011 and 2019, the developmental extent of the digital industry in Shanwei was lower than that of its surrounding cities. Although the gap between the Shanwei and Jieyang-Chaozhou-Shantou metropolitan areas became smaller, the difference between Shanwei and the Greater Bay Area cities remained substantial. Furthermore, Shanwei’s attention to the digital economy showed an upward trend in 2018–2022 and a declining trend in 2023–2024. It exceeded Chaozhou and was catching up with Huizhou, Shantou, and Jieyang in 2024. However, it still lagged far behind Shenzhen. Lastly, the level of innovation and entrepreneurship in Shanwei’s digital industry exhibited an upward trend from 2011 to 2020. The index value was lower than all surrounding cities during 2011–2014. This situation changed in 2015, 2016, 2017, and 2020 because Shanwei surpassed Jieyang and Chaozhou in those years, but it still lagged consistently behind the Greater Bay Area cities and Shantou.

In sum, the digital industries in Shanwei are thriving and achieving significant progress, with both internal and external environments providing ongoing support. However, there is still a gap compared to surrounding cities, especially those in the Greater Bay Area. Shanwei should use its resource endowment, learn from the experiences of neighboring areas, and make good use of local policies such as “the 14th Five-Year Plan for National Economic and Social Development and the 2035 Vision Outline of Shanwei City” and “the Implementation Plan for Promoting Digital Economy Development in Shanwei.” Detailed policy suggestions are presented below:

The first suggestion is to enhance innovations in digital technologies. First, Shanwei should develop vital digital technologies, and financial institutions could offer various technology credit products to support enterprises in pillar industries such as electronic information, offshore engineering equipment, petrochemicals, and power energy in undergoing digital transformation. Firms should cooperate with universities and research institutions in the Greater Bay Area to overcome difficulties in critical digital technologies and introduce

provincial-level projects, thereby boosting independent innovation capabilities. Second, it is suggested to build digital technology innovation platforms and provide funding based on classification levels to established and recognized national-level and provincial-level innovation platforms, municipal-level new-type R&D institutions, and enterprise development centers. Authorities must collaborate with digital transition service providers to establish demonstration parks to digitize the manufacturing sector. This will promote the aggregation of data, technology, and other elements across various industry platforms. Third, Shanwei could introduce digital technology enterprises to settle in Shanwei Innovation Island (Shenzhen) by providing property management fee subsidies, land use guarantees, and tax incentives, and recruit innovative talents nationwide by promising talent subsidies and green channels for professional title promotion. Last, Shanwei should accelerate the commercialization of digital technology innovation achievements, in terms of expanding the registration services for technology contracts, carrying out intellectual property cooperation, strengthening science and tech service institutions, and constructing a supercomputing center to support data resources.

The second suggestion is to construct digital infrastructure (Rehman and Noman, 2020). First, Shanwei could enhance its digital infrastructure by using Shanwei High-tech Zone and Haifeng High-tech Zone to build a green data center industrial base, increase big data business capacity, attract internet brand enterprises, gather computing power resources, and establish new infrastructure computing power industry ecological bases, big data service industry hubs, and digital application innovation and entrepreneurship headquarters. Second, it is vital to facilitate the development of next-generation communication infrastructure. Shanwei should increase investment in 5G cellular networks, data centers, cloud services, and artificial intelligence, and build a “fiber + 5G” dual-gigabit optical network city. Particularly, Shanwei should adhere to “the Special Plan for 5G Base Station and Smart Lamp Post Construction in Shanwei City (2020–2025)” and increase investment and policy support (Miraz and Soo, 2024). The China Tower Corporation should formulate technical documents such as the planning and design guidelines for 5G base stations, standard drawing sets, construction regulations, completion acceptance guidelines, and post-maintenance guidelines, as well as other relevant rules and regulations to ensure their effective implementation and smooth progress. China Tower and telecommunication operators should prepare annual network construction and investment plans to achieve network coverage and build 5G demonstration projects as required by provincial and municipal government targets. Third, Shanwei needs to develop computing infrastructure in terms of building large-scale data centers and cloud computing hubs to establish a supercomputing and storage platform, and develop information innovation servers, storage devices, and supporting equipment for data centers.

The third suggestion is to expedite the digitization of its manufacturing industry. First, Shanwei aims for intelligent manufacturing by carrying out technological transformation in the manufacturing industry and increasing the adoption of the Internet, big data, and AI across various sectors of the manufacturing industry. Particularly, it can establish a pilot program for smart factories construction and promote the application of industrial Internet in fields such as electronic information manufacturing, biomedicine, equipment manufacturing, handicraft processing, and electric power and energy. Second, Shanwei can accelerate enterprises’ digital transformation and support small and medium-sized enterprises in industrial clusters in developing together through collaboration with industrial internet platform providers. This will result in the “cloud and data intelligence” of the industry chain and supply chain. Third, Shanwei should develop industrial internet software and apps, covering the needs of various business processes from research, development, production, operations, to management (Swan *et al.*, 2021).

The fourth suggestion is to legislate for Shanwei’s digital economy. Drawing on the “Regulations on the Promotion of the Digital Economy Industry in the Shenzhen Special Economic Zone,” which were implemented in November 2022, and the “Regulations on the Promotion of the Digital Economy in the Shantou Special Economic Zone,” which were

implemented in October 2023, Shanwei should promptly establish legal measures in fields like digital infrastructure, industrial transformation, data transactions, digital governance, and element protection to promote the sustainable growth of the digital economy.

Three marginal contributions are made by this study. First, this study fills a research gap by showcasing how a coastal city with limited resources can build a digital economy. Second, three measures assess Shanwei's digital economy and compare it with neighboring cities, shedding light on each city's strengths and weaknesses and enriching cross-city comparative studies on regional digitalization. Third, other less developed and coastal cities may draw inspiration from Shanwei's digital economy strategies.

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