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The Composition and Operation Mechanism of Digital Entrepreneurial Ecosystem: A Study of Hangzhou Yunqi Town as an Example

Jiewang Chu and Jiaxuan Li *

Department of Management, Anhui University, Hefei 230093, China
* Correspondence: a1159892696@icloud.com

Abstract: Purpose—The digital entrepreneurship ecosystem (DEE) literature is dominated by conceptual studies and lacks micro-level theoretical foundations and empirical evidence. This study aims to explore the largely overlooked question of what the components and operational mechanisms of DEE are. **Design/methodology/approach**—The study adopts a qualitative exploratory approach. The empirical data consist of field research, semi-structured interviews, and web-based information. Hangzhou Dream Town, China, is the research object. **Findings**—This study reveals the composition and operation mechanism of DEE. The operation mechanisms of DEE include opportunity symbiosis and value symbiosis. Compositions include digital users, digital entrepreneurs, investment institutions, governments, etc. **Practical implications**—This study contributes to DEE research by analyzing China's DEE to help other regions understand how government-driven DEEs are established. This study also helps Digital Startups understand how the DEE works, which allows them to achieve digital entrepreneurship. **Originality/value**—The study draws evidence from a micro-level perspective which enriches understanding of the DEE phenomenon. It also provides theoretical support for the establishment of a DEE.

Keywords: digital entrepreneurial ecosystem; digital entrepreneurship; operation mechanism; dream town

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1. Introduction

In the context of the expansion of the global digital economy, emerging digital technologies such as big data, cloud computing, artificial intelligence, blockchain are rapidly developing (Kraus et al., 2018) [1], while many new business models are also forming (Nambisan, 2017) [2]. Rapid advances in digital technology have profoundly changed the business playing field, reshaped traditional business strategies, models and processes (Bharadwaj et al., 2013) [3]. The use of digital technology by traditional enterprises to start second businesses is an important path of enterprise leapfrogging. However, digital entrepreneurship is closely related to partners and the external environment, and it is difficult to achieve with the power of one company alone.

The Digital Entrepreneurial Ecosystem (DEE) is a fusion of the digital ecosystem and entrepreneurial ecosystem (Sussan and Ace, 2017) [4]. Digital ecosystems are distributed open technology systems made up of digital technology and digital entities (Li et al., 2017) [5] which are centered on the needs of digital users and use digital technologies to create, distribute and connect to provide digital products and digital services. An entrepreneurial ecosystem is a complex system that can support entrepreneurship, facilitate the sharing of entrepreneurial resources, and provide perfect entrepreneurial hardware facilities (office environment, logistics, transportation, etc.) and soft services (policy support, entrepreneurial culture) (Acs, 2014) [6]. The digital entrepreneurial ecosystem combines the advantages of both, which breaks the limitations of the traditional section and platform organization development and achieves the synergistic symbiosis of multiple subjects at

the ecosystem level (Sussan and Ace, 2017) [4] and the structured development of entrepreneurial elements (Thompson et al., 2018) [7]. The digital entrepreneurship ecosystem has also changed the previous situation of insufficient organizational resources, abandoned the traditional organizational thinking about competition, built a new organizational form that combines online and offline elements, and formed a dynamic competition and cross-border competition normalization model (Sahut et al., 2021 [8]; Wurth et al., 2022 [9]).

However, despite the growing number of studies interested in DEEs, some important aspects still need to be further explored. First, most of the current research on DEEs has been conducted at the macro level, such as how to build a digital entrepreneurship ecosystem at the national or regional scale (Malecki 2018 [10]; Spigel 2017 [11]; Cunningham 2019 [12]). However, at the micro level, there is a lack of discussion on the components and operation mechanism of the DEEs, which leads to entrepreneurs not understand the co-evolution of each entrepreneurial subject or the connection between entrepreneurial subjects and the ecosystem (Wurth et al., 2022) [9]. Second, the formation and development of a DEE is a long process, and a synergistic mechanism among subjects is the key to sustain its development (Spigel and Harrison, 2018) [13]. However, previous literature has largely ignored the cooperation mechanism among multiple subjects and lacks research on the stage evolution of DEEs. In addition, analyses of relevant cases are still lacking due to the complexity and specificity of the research object. Spigel, (2017) [11]; De Brito and Leit~ao, (2021) [14] have pointed out that more empirical research on this phenomenon is needed because our understanding of DEEs is still incomplete and conceptual studies dominate the field.

To address the above research questions, this study adopts a micro-level perspective and empirically explores the composition and operation mechanism of the digital entrepreneurship ecosystem with multi-entity participation. The study chose Dream Town in Zhejiang, China as a case study and used the case study to answer the following questions: What are the underlying elements and formation process of Dream Town as a digital entrepreneurship ecosystem? How do the synergistic mechanisms of the digital entrepreneurship ecosystem operate? What are each subject's roles and function in it? To address the above issues, our study uses the existing literature on DEEs to form a loose theoretical framework, followed by an exploratory study of the digital entrepreneurship ecosystem in Dream Town based on the theoretical framework. Data sources for the cases include field interviews, research, official websites, news, and many other sources. Through empirical analysis, our findings ultimately contribute to the study of DEEs at the micro level.

2. Literature Review

2.1. The Connotation and Composition of the DEE

The DEE is the product of the convergence of the digital system and entrepreneurial ecosystem. It can connect producers and consumers of digital products on digital platforms, thereby reducing transaction costs, and creating additional value and social utility (Sussan and Ace, 2017) [4]. To clarify the specific connotation of the digital entrepreneurial ecosystem, we reviewed the related studies on the entrepreneurial ecosystem and digital ecosystem. The subjects and elements of the entrepreneurial ecosystem and digital ecosystem are reported in Table 1.

Table 1. Subjects and elements of the digital ecosystem and entrepreneurial ecosystem.

Research Perspectives	Author (Year)	Composition	
		Entrepreneurial Subjects	**Entrepreneurial Elements**
Entrepreneurial Ecosystem	Wachira (2022) [15]	Government, clients, investment institutions, educational institutions, public institutions, professional institutions	The system, natural environment, market, policy, infrastructure
	Bichler (2022) [16]	Government, science and technology parks, universities, social networks, investment institutions, support services, technology companies, etc.	Policy, funding, market, human capital, culture, supportive environment
	Suresh and Ramraj (2012) [17]	Investment institutions, government, intermediaries, social networks, etc.	Ethical, financial, technological, market, financial, social, network, policy, environmental systems
	Cohen (2006) [18]	Startups, large enterprises providing technical support, governments, universities, research institutions, investment institutions, intermediaries	Policy preference, talent supply, financial support, professional consultation, basic setup, social norms, geographical location
Digital Ecosystem	Nambisan (2017) [2]	Digital infrastructure, digital users, digital startups	Digital Technology and Digital Markets
	Dini et al. (2011) [19]	Digital technology, digital users	Digital Environment
	Weill and Woerner (2015) [20]	Digital users, government, research institutions, investment institutions	Digital technology, digital environment, digital culture

According to existing articles, the core of the DEE is digital entrepreneurship and development through symbiotic relationships between digital subjects.

Based on the literature review, we extracted the subjects and key elements of the DEEs, which also gave us a more accurate understanding of the characteristics of the DEEs: the digital entrepreneurship ecosystem is made up of digital technology, digital users, digital entrepreneurship, and digital markets. Digital technology is the main driver for the development of DEEs (Elia, G, 2020) [21]; (Von Briel, 2018) [22]. Digital technology manifests itself in entrepreneurial activities in various forms, such as digital products or services (Lyytinen et al., 2016) [23], digital platforms (Tiwana et al., 2010) [24], digital tools or infrastructure (Aldrich, 2014) [25], digital artifacts or internet service innovation (Kuester et al., 2018) [26]. A digital entrepreneurial environment is a prerequisite to guarantee the survival of digital entrepreneurial subjects, including the digital technology environment, digital market, digital economy, and institutional environment (Rippa and Secundo 2019) [27]. Digital entrepreneurship subjects are the core elements in the DEEs, mainly including core subjects (digital entrepreneurship enterprises) and participating subjects (digital users, governments, universities and research institutes, etc.) (Kuebart, 2019) [28].

2.2. Research Schools of Thought on the DEE

The current academic research on DEE is divided into three main schools of thought. (1) DEE and the relationship between digital technology and entrepreneurial opportunities and entrepreneurial process (Gawer and Cusumano, 2014) [29]. (2) The relationship between DEE and business model innovation and value creation (Nambisan et al., 2018) [30].

(3) Relationships between subjects within the DEE, mainly including the strategic and competitive advantages of firms and the interaction between the dominant firms and participating firms (Jacobides et al., 2018) [31]. For the first school of research, scholars are more concerned with how entrepreneurial motivations and influencing factors facilitate digital subjects to join the DEE. First, in terms of entrepreneurial motivation, individual entrepreneurs may join the DEE for reasons such as financing, entrepreneurial opportunities, or emotional needs (Elia et al., 2016) [32]. Digital startups may be motivated to participate in the DEE by leveraging their platform networks to gain broader social reach and access to early customer resources (Ahmetoglu et al., 2017) [33]. Recent studies have shown that the dominant firm in the DEE significantly influences the entry of individual entrepreneurs and digital startups (Torres and Godinho, 2021) [34]. The second school of research focuses on how the DEE facilitates value creation through digital subjects and innovation in business models. First, digital technology, as an important element of the DEE, has greatly improved the efficiency of value creation in the DEE. On the one hand, digital technology has promoted the flow of information within the DEE, especially knowledge spillover and the proliferation of emerging technologies, which provide a large number of entrepreneurial opportunities for digital subjects (Ahmetoglu et al., 2017) [33]. On the other hand, digital technologies can also fuel products and service innovation to stimulate entrepreneurial creativity to form highly innovative business solutions. In addition, digital technologies help to reduce communication and coordination costs (Rippa and Secundo, 2019) [27] and rapidly attract high-quality partners (Spigel, 2017) [11]. Second, the DEE can also promote business model innovation. Digital subjects exchange resources with each other in the DEE form new entrepreneurial alliances to achieve business innovation (Muegge and Mezen, 2017) [35]. The third faction focuses on the governance within the DEE and the cooperative competition between subjects (Cennamo and Santalo, 2013) [36]; (Gawer, 2014) [37]. The DEE as a collaborative model, whether the ecosystem tends to be complex or simple internally, has been the focus of managers. If the ecosystem tends to be complex, the DEE can achieve complementarity of existing products and services by introducing new digital subjects (Eckhardt et al., 2018) [38]. If the ecosystem tends to be simple, the dominant firm in the DEE can adopt an exclusionary strategy to increase the homogeneity of products within the DEE (Jacobides et al., 2018) [31]; (Zhu, F., and Liu, 2018) [39].

The literature review shows that, although scholars have conducted rich research on DEE, there are still some problems. First, existing studies have not explored the evolutionary laws of DEE, which leads to difficulties for digital entrepreneurs in properly understanding the nature of DEE. Second, the synergistic model of digital subjects has also not been well addressed.

2.3. Composition and Synergistic Symbiosis of Digital Subjects

Digital subjects in DEEs do not simply compete or cooperate, but instead form a symbiotic relationship of interdependence. Existing research suggests that symbiotic relationships between digital subjects are a necessary prerequisite for driving the evolution of DEEs (Zahra and Nambisan, 2012) [40]. Digital subjects have different responsibilities and tasks in the digital entrepreneurship ecosystem, and they simultaneously contribute to the advancement of digital entrepreneurship (Gómez-Uranga et al., 2014) [41]. Based on the literature review and the research results of Zhu and Yang (2022) [42], we present the composition and functions of digital subjects, as shown in Table 2.

Table 2. Components and functions of the digital subject.

Composition and Function of the Digital Subject	
Elements	**Function**
Digital Startups	• Performing digital innovation and entrepreneurial activities • Providing digital products or services • Meeting and creating digital user needs • Leading the development of the digital entrepreneurship ecosystem
Digital Users	• Digital User Engagement • Digital User Innovation • Digital User Entrepreneurship
Government	• Building and guiding a network of DEE • Coordinated allocation of entrepreneurial resources • Building a good digital environment
Universities, Research Institutes	• Developing Digital Technologies • Nurturing Digital Talent and Educating for digital entrepreneurship • Incubating Digital Entrepreneurship
Investment Institutions	• Provide funding for start-ups, R&D, and production • Provide value-added services to digital startups with our own human and social capital
Entrepreneurial Service Provider	• Provide basic business services • Provide physical space and infrastructure for digital entrepreneurship • Connect the functions of different subjects, realize digital resource docking and collaboration, and promote digital technology and creative transformation
Digital Incubator	• Provide basic production and operation sites and office facilities for enterprises • Provide technical support

There are two main symbiotic relationships between digital subjects in entrepreneurial activities, which are also the main expressions of the evolutionary mechanism of the digital entrepreneurship ecosystem, namely value symbiosis and opportunity symbiosis (Zhu et al., 2020) [43]. Opportunity symbiosis refers to the relationship formed by digital subjects around the development of entrepreneurial opportunities. On the one hand, due to complementary resources and capabilities, leading companies with the ability to identify or create opportunities will attract more digital subjects to gather to jointly develop entrepreneurial opportunities; on the other hand, through the development of entrepreneurial opportunities, entrepreneurial subjects will promote and expand the original entrepreneurial direction and generate new entrepreneurial opportunities. As more opportunities are provided by DEEs, the symbiotic relationship formed by digital subjects will become closer and more complex. This will lead to more entrepreneurial activities, and more new products, technologies, and services will be created. The evolutionary process of opportunity symbiosis mainly includes loose symbiosis, aggregated opportunity, and spillover symbiosis. Value symbiosis is the process of value co-creation among digital subjects, and the process mainly involves distributing value and creating value. The value symbiosis relationship is generally divided into parasitism, partial benefit symbiosis, asymmetric reciprocal symbiosis, and symmetric reciprocal symbiosis, and the four evolve in sequence (Chertow and Ehrenfeld, 2012) [44]. For the specific manifestations of the different stages, the study will be described below. Existing research shows that the core of the digital entrepreneurship ecosystem is to achieve digital entrepreneurship and common development through symbiotic relationships between digital subjects (Autio et al., 2018) [45]; (Srinivasan and Venkatraman, 2018) [46].

2.4. Evolutionary Stages of the DEE

The essence of the evolution of the DEE is that digital entrepreneurial subjects promote the effective generation, exchange, and allocation of materials, information, and energy and build symbiotic relationships among subjects based on interaction and cooperation, ultimately realizing the high-speed development (Zhu et al., 2020) [43]. In previous studies,

life cycle theory has been used to describe the evolution of the entrepreneurial ecosystem. The evolution of the entrepreneurial ecosystem has been divided into birth, growth, sustainability, and decline stages (Mack, E., and Mayer, 2016) [47]. Some scholars also believe that the evolutionary process of the entrepreneurial ecosystem includes generation, growth, and decline periods (Stam and Spigel, 2016) [48]; (Bai, 2015) [49]. Based on the research results of scholars, this study considers the evolutionary stages of the DEE as the incubation stage, growth stage, and maturity stage. The synergistic symbiosis model of digital subjects is an effective expression of the ecosystem of digital entrepreneurship. One is the opportunity symbiosis model and the other is the value symbiosis model (Zhu and Li, 2011) [50]. During the incubation stage of DEE, the number of digital entrepreneurs is small, and the type of subject is individual entrepreneurship. Their development opportunities are primarily based on their inherent entrepreneurial paths, and they have little correlation with each other in terms of achieving entrepreneurial value. Therefore, the opportunity symbiosis mode in this stage is loose symbiosis, and the value symbiosis mode is a parasitic mode or partial benefit symbiosis mode. As the system evolves, the types of digital startups will increase in number and become more connected as their business scope expands, but those startups that occupy the top positions in the industry will dominate the cooperation process. The opportunity symbiosis model at this stage is aggregation symbiosis, and the value symbiosis model is asymmetric reciprocal symbiosis. As the DEE develops, collaboration among digital entrepreneurship subjects reaches the optimum, and opportunity symbiosis becomes overflow symbiosis. Multiple subjects collaborate to explore various development paths and entrepreneurial opportunities. The value symbiosis mode also reaches the stage of reciprocal symbiosis, in which all subjects in the digital ecosystem mutually benefit from each other and develop together. Due to the complexity and diversity of the DEE, the study concludes that the evolution of the DEE should not be limited to the evolution of the development stage. Instead, it should include the evolution of the kernel of the DEE. The evolution of the kernel mainly refers to the evolution of the digital entrepreneurship environment, and the evolution of the digital entrepreneurship network.

2.4.1. Evolution of Digital Entrepreneurship Network

A digital entrepreneurship network refers to a special network formed by digital entities as network nodes. In the early stage of digital entrepreneurship ecosystem construction, the digital entrepreneurship network shows the characteristics of geopolitics. According to the Allen curve, the frequency of collaboration between different digital entrepreneurial subjects surges as distance decreases, because geographical proximity helps enhance spatial stickiness and capture tacit knowledge (Allen, 2016) [51]. With the development of the DEE, the digital entrepreneurship network is no longer confined to geo-requirements, but a more distant network based on industry and social activities.

In terms of the radiation area, the digital entrepreneurship network will gradually cross the limits of geographical administrative areas such as parks, towns, and streets, and build a digital entrepreneurship network formed by multiple entrepreneurial communities. Then it will realize the transformation from digital entrepreneurship "regions" to digital entrepreneurship "communities". From the radiation target, the digital entrepreneurship network will be radiated from the central node to the associated nodes and then to the edge nodes. Therefore, the formation of digital entrepreneurship networks is often led by core enterprises.

2.4.2. The Evolution of the Digital Entrepreneurial Environment

The environment refers to the tangible and intangible environment of DEE. The geographic location of the DEE is not evenly or randomly distributed with the development of information technology, but tends to be concentrated in urban centers, as some scholars have predicted (Fagerberg, 2005) [52]. In other words, the digital entrepreneurial environment is gradually transitioning from "campus-based" to "urbanized". According to Sassen's [53] civtyness theory, the "urban area" entrepreneurial environment has significant

advantages in both the physical and intangible environments. The physical environment is characterized by highly flexible innovation spaces, high-coverage innovation facilities, and large-scale test scenarios. The intangible environment is characterized by a highly inclusive policy environment, a highly mixed cultural atmosphere, and highly intensive knowledge overflow. Therefore, the digital entrepreneurship environment is gradually evolving from "campus-based" to "urban-based".

2.5. The Theoretical Framework of the Evolution Mechanism of the DEE

This study plots the evolutionary stages of the digital startup ecosystem, as shown in Figure 1. Based on the evolutionary path drawn, the study will select appropriate cases for empirical analysis.

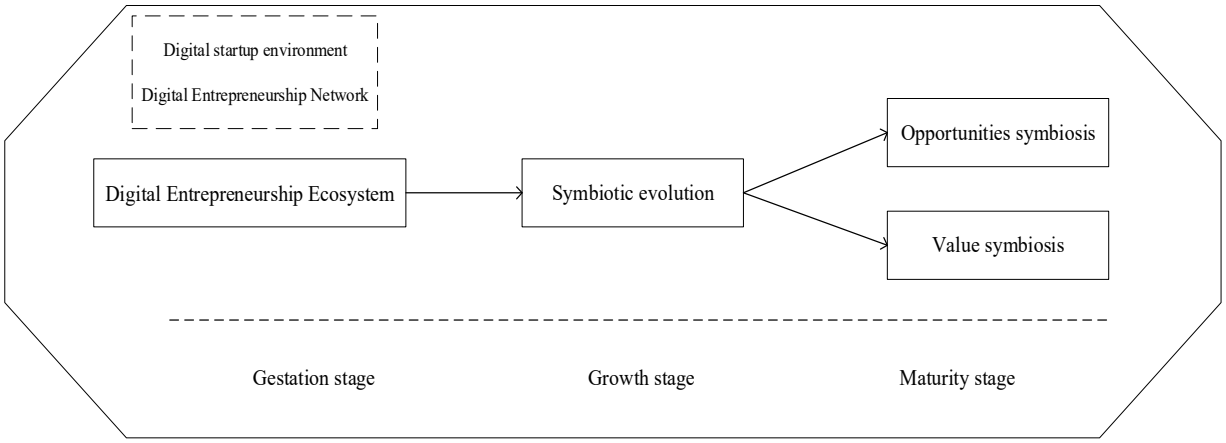


Figure 1. Theoretical framework of the evolution mechanism of the DEE.

3. Methodology

This study uses an exploratory, single case study approach. It is an empirical research method that observes, describes, and analyzes reality to determine its particularity. Through tracking and profiling key variables of the research subject and their interrelationships, especially when temporal variables are involved, it is possible to identify key variables of the research subject. This approach is suitable for studying issues that have not been fully explored in existing findings. The purposes of this study are to explore the synergy between subjects in the digital entrepreneurship ecosystem and uncover the evolution mechanism of the digital entrepreneurship ecosystem. In addition, for this study, it is necessary to track the performance of the same research object over different periods. The single case study method is more suitable for this problem.

3.1. Research Case Selection

This paper selects the Dream Town of Hangzhou as a small research case of digital entrepreneurship ecology, for the following three reasons:

(1) Uniqueness of the case. Dream Town is a DEE created by Hangzhou City based on the industrial ecology of Alibaba's headquarters and financial resources, through the creation of a "crowdsourcing space", "gas pedal", and "O2O service system". Dream Town is a digital entrepreneurship ecosystem based on Alibaba's headquarters and financial resources. Alibaba's cloud ecology is at the core of the town's ecosystem, around which digital subjects build their ecological chains. Secondly, the Alibaba-led innovation network was built only after it settled in Dream Town, which makes this case conducive to studying the whole process of digital entrepreneurship ecosystem evolution. Finally, Dream Town is a well-developed digital entrepreneurship town, and the pulling effect of the town on regional economic and social development is highly recognized by the government and society.

(2) The operability of the research. Eight years after its inception in 2015, Dream Town's development process is extremely complete, with significant differences in each stage, which can provide relevant material for this study. In addition, the dynamic development process of Hangzhou Dream Town can be analyzed to conclude with certain universality. This will provide a reference for the practical and theoretical investigation of digital entrepreneurship ecosystems.

(3) Availability of data. The research team once lived in Hangzhou, and colleagues were able to talk to the relevant responsible persons and start-up entrepreneurs in the Dream Town, which was convenient for obtaining first-hand interview data. Moreover, as a leading enterprise in Internet entrepreneurship, Alibaba has produced much attention and has formed a series of achievements and reports. Therefore, it is easier to obtain relevant data.

The specific research steps in this paper are shown in Figure 2.

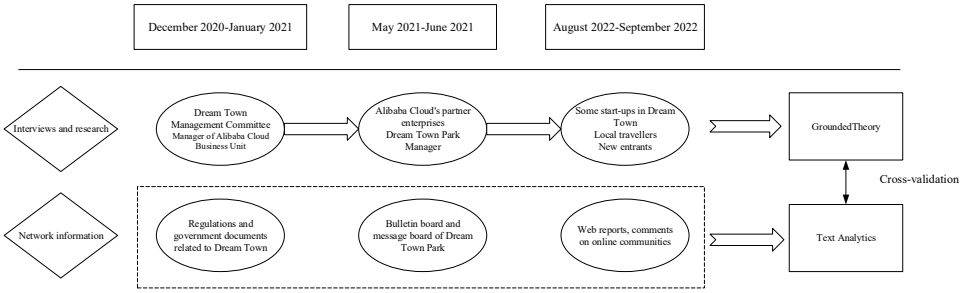


Figure 2. Research steps.

3.2. Research Data Collection

The research data were collected primarily through field research, interviews, and online data collection. Field research and interviews were divided into three stages. The first research was conducted in December 2021–January 2021, with informal interviews with the Dream Town Management Committee and Alibaba business unit managers to gain a deeper understanding of the case and research questions, and to lay the groundwork for subsequent research. This was followed by semi-structured interviews with Alibaba's partner companies in May–June 2021 for in-depth analysis based on the content of the first research; this was followed by research on some startups in Dream Town in August–September 2022 to understand the development of startups in DEE. Finally, we will obtain secondary information through the media and the internet, to confirm and improve the primary information.

4. Hangzhou Dream Town Case Description

Background of the Case

Dream Town is one of the few digital entrepreneurship towns in China that is dominated by Internet entrepreneurship. Located in the heart of the Future Science and Technology City in Hangzhou, Zhejiang Province, Dream Town relies on Alibaba and the Future Science and Technology City Park to become a model for national-level Internet innovation and entrepreneurship in China. It has been listed among China's top ten characteristic towns. Dream Town was established in 2015. Taking advantage of China's entrepreneurship policy, Dream Town made significant economic strides in 2018. In 2018, the tax revenue of the town's enterprises was 200 million yuan. The revenue amounted to 4.26 billion yuan. During 2018–2021, Dream Town encouraged a group of well-known companies such as Shenzhen Zijingang Ventures and Liangcang Accelerator, as well as two US Silicon Valley platforms such as 500 Startups and Plug & Play, to settle in the town. Based on network information, field research, and interviews, the study mapped the development trajectory of the Dream Town. After communicating with the local information service, the trajectory map was modified, as shown in Figure 3.

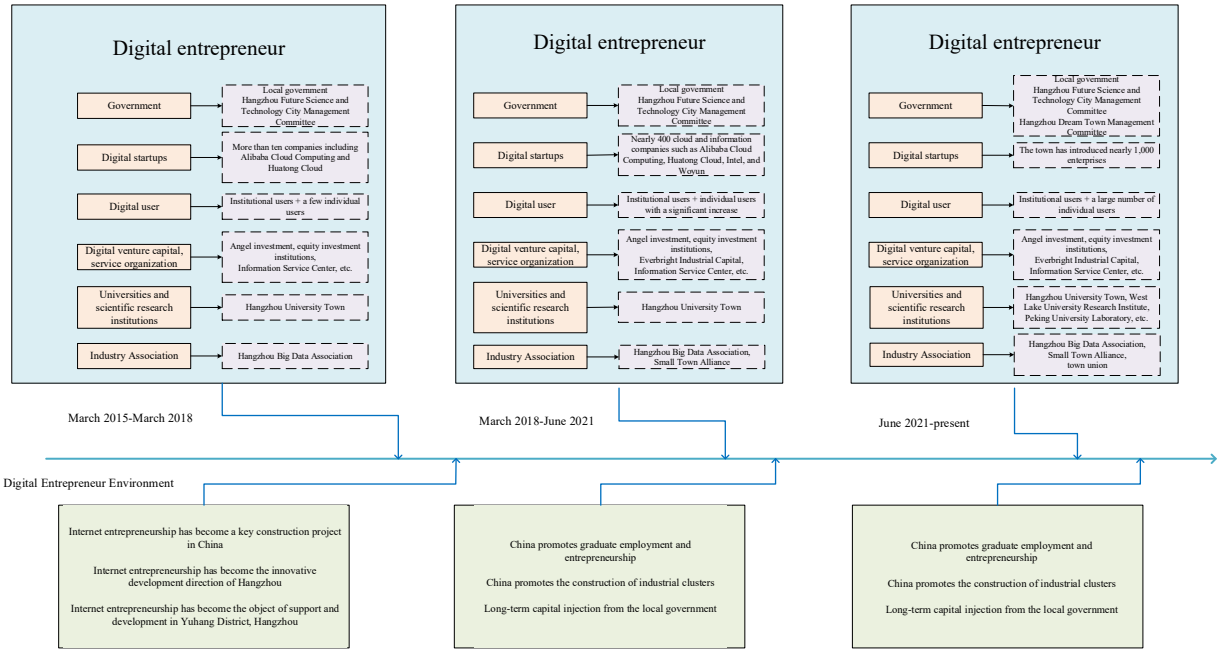


Figure 3. Development history of Dream Town.

5. Analysis of the Development Stage of the DEE in Dream Town

5.1. Gestation Stage: Builder-Led and Ecosystem Initiation

Dream Town is a typical government-led DEE (Bernardez and Mead, 2009) [54]. In the early days of the establishment of Dream Town, the DEE entered the gestation stage. At this stage, the government, as the main builder, assumed the responsibilities of site selection, park construction, selection of digital start-ups, and financial support. The guidance of the government is an important prerequisite for the establishment and rapid development of the DEE. Dream Town has two significant time nodes in the gestation stage. One concerns how the government perceived the upcoming boom of Internet entrepreneurship, and set aside a piece of land in Hangzhou specifically to gather Internet entrepreneurial talent and venture capital institutions to create a low-cost Internet entrepreneurship town, which is the origin of Dream Town. The second node is the listing of China's Alibaba so that a group of people achieved financial freedom. They brought their projects and funds to Dream Town, which is very close to Alibaba's headquarters, and became the first investors or entrepreneurs in Dream Town.

At the early stage of the establishment of Dream Town, the government decided to build it in the ancient town of Hangzhou. This was far from the city center and close to the ecological park and university town. To promote the development of DEE, the local government provided tremendous help. It included making Dream Town into a special local industrial base, providing rent reductions, financing subsidies, and a series of other measures. Despite the strong support from the government, the Chinese market was largely lacking in the promotion of Internet entrepreneurship. Most companies were still on the fence about investing in Internet entrepreneurship projects. Therefore, the initial development of Hangzhou Dream Town still faced great problems, for example with Cloud computing. In the incubation phase of the digital entrepreneurial ecosystem, Dream Town had less than 10 companies involved in cloud computing. However, cloud computing has been developed for many years by companies in the United States, such as Amazon. In addition to the small number of digital startups in Dream Town, the number of digital users is equally small, most of which are corporate employees. Faced with this situation, how the government guides and promotes the development of the digital entrepreneurial ecosystem becomes the key. At that time, the governor of Zhejiang Province proposed that Dream Town should establish links with Alibaba and University City. This would

enable Alibaba's market and technical advantages to attract more enterprises and help college graduates in University City to start their businesses. He proposed to establish the core population of the digital entrepreneurship ecosystem first, and then gradually expand it to the whole ecosystem and make it evolve and grow. Eventually, several famous entrepreneurial clusters such as Internet Village, Angel Village, and Venture Street were built in Dream Town from 2015–2018. The formation of the Internet Village, a cluster of digital startups, and the Angel Village, designed to support investment institutions in digital entrepreneurship, have greatly facilitated the development of digital startups.

5.2. Growth Stage: Herd Effect and Multi-Subject Synergy

In the growth stage of DEE, the digital entrepreneurship subjects have strong "homogenization" characteristics, and the "herd effect" of industrial development is becoming more and more obvious (Tedeschi et al., 2012) [55]. From 2020 to 2021, Zhejiang Province carried out digital economic reform, and Dream Town became the main development object. Later, due to Alibaba's leadership role, market forces gradually took over the "baton" from the hands of the government, and many companies involved in Internet entrepreneurship began to pay attention to Dream Town. Dream Town also attracts digital startups to join the town through various means such as policy support, accelerating the progress of existing enterprises, and investing in startups. From the perspective of a digital entrepreneurial network, Dream Town has formed a core entrepreneurial network with Alibaba, Zijin Creators, Dream E-Business, etc. The rest of the startups are located at the edge of the entrepreneurial network and are subject to economic, technological, and technical radiation. From 2018–2021, Dream Town introduced nearly 500 companies and gathered more than 2000 startup projects. However, at this stage, digital startup projects are highly similar, and digital businesses also overlap. What is more, the startups will follow mature companies' footsteps in developing related projects, so the "homogenization" feature is extremely obvious. For example, live streaming and building an APP platform in the early stages of Dream Town account for a large proportion.

During the growth stage, the digital entrepreneurship ecosystem will be self-organizing. At this stage, in addition to the "homogeneous" characteristics, the synergy between digital subjects is also evident in Dream Town. To start with, there are Alibaba and Zijin creators, Angel investment Zijin, Dream Town Management Committee, and other loose alliances in the Down Town. These alliances are designed to provide a number of entrepreneurial services to help startups grow. Secondly, a synergy effect is created among digital startups, and startups begin to provide services for each other.

5.3. Mature Stage: Ecological Stability and Multi-Subject Symbiosis

In its mature stage, Dream Town developed into an ecological cluster with Alibaba as the core. With the first residents of Dream Town successfully realizing digital entrepreneurship, the ecology of Dream Town became more stable. The ecological stability of Dream Town is marked by the following points: 1. Four entrepreneurial sub-clusters have been formed around the core cluster of Dream Town: Internet Village, Angel Village, Entrepreneurial Bazaar, and Entrepreneurial Street. The different entrepreneurial clusters have a unique division of labor. 2. The main subjects of digital entrepreneurship in Dream Town have formed a group of entrepreneurial entities, "Ali Department, Zhejiang University Department, Returnee Department, and Zhejiang Local Enterprises Department". Different groups of entrepreneurs have similar backgrounds in digital entrepreneurship. 3. Dream Town has richer experience in helping digital start-ups, and can provide targeted and specialized evolutionary services for start-ups and entrepreneurial teams in different development stages.

From the perspective of Dream Town's support for startups, by 2022, Dream Town had accumulated 2879 startup projects, 23,324 entrepreneurial talents, and 254 projects with financing of more than one million yuan, with total financing of 13.597 billion yuan. Dream Town has introduced Liangcang Evolver, Hive Evolver, and other famous evolvers

to provide enterprises with a full range of services such as capital, talent, and technology. In terms of investment institutions, Dream Town has entered a large number of angel investment institutions, such as Sabre Investment, Puhua Capital, Huarui Investment, Yuanjing Capital, Haibang Investment, and Angel Bay Venture Capital.

From the perspective of the subjects of the DEE, the management of an ecosystem of digital entrepreneurship did not become more confusing as more companies entered. On the contrary, the digital subjects cooperated and established the Hangzhou Dream Town Management Association jointly to manage the Dream Town. In addition, digital entities have jointly formed a full evolutionary chain of "Startup Campus + Evolver + Accelerator" to help digital startups at different stages.

6. The Dynamic Evolution Mechanism of DEE

Through the above analysis of the development process of Dream Town, we have divided the evolutionary stages of the DEE. The next study explores the evolutionary mechanism of DEE in the case of Dream Town. In this section, the study focuses on the following three aspects.

(1) The main characteristics of the DEE at different stages.
(2) The expressions of value symbiosis and opportunity symbiosis in DEE at different stages.
(3) The evolution of digital entrepreneurship models, environments, and networks.

6.1. Opportunity Symbiosis and Value Symbiosis

Opportunity symbiosis and value symbiosis are the most dominant symbiosis modes of digital subjects (Chen et al., 2022) [56]. In the gestation stage of Dream Town, digital subjects only include government, digital startups, digital users, digital gas pedals, and industry associations (Tiwana et al., 2010) [24]. Among digital subjects, there is a loose symbiosis model (Orton and Weick, 1990) [57]. The loose symbiosis model refers to the fact that most of the subjects rely on themselves for the exploration of entrepreneurial opportunities (Clarysse et al., 2014) [58]. Furthermore, there is almost no connection between them. The value symbiosis mode between digital subjects is a parasitic mode or a biased benefit symbiosis mode. Subjects in disadvantageous positions at this stage will depend on subjects in advantageous positions, such as digital startups and digital users, who will benefit from the government's early policy preference and financial support. The government will provide coaching, resource and service support for digital startups.

In the growth stage of Dream Town, the symbiotic relationship among digital subjects is one of aggregation. If they are limited in their development or find it difficult to gain value, they will look for new entrepreneurial opportunities. Their focus gradually shifts toward their peers, investment institutions, and evolutionary institutions in the digital entrepreneurial ecology, to expand their businesses through the aggregation effect. The symbiosis model among digital subjects changes to asymmetric reciprocal symbiosis. Digital subjects begin to cooperate and benefit individually, but those in a dominant position are still able to obtain more benefits (Alvarez et al., 2015) [59]. This phenomenon is manifested by the fact that AliCloud is often in a dominant position in cooperation with related cloud enterprises.

In the mature stage of Dream Town, the number and types of digital subjects have increased significantly. Digital subjects include government, digital startups, digital users, financial institutions, intermediaries, industry associations, etc. There are many digital subjects involved in the life cycle of digital entrepreneurship, especially when the first batch of Dream Town entrepreneurs succeeded. They brought external resources into Dream Town, which no longer limited the entrepreneurial opportunities in the DEE to the inside of the system. At this stage, the opportunity symbiosis model evolves into a spillover symbiosis. In addition, the value symbiosis model of the digital entrepreneurship ecosystem transforms into a reciprocal symbiosis model. Most of the digital subjects gradually move from dependence on the leading enterprises to independent survival as their strength rises,

and they achieve equal development with related enterprises (Le Breton-Miller and Miller, 2009) [60]. The evolution path of the DEE in Dream Town is shown in Figures 4 and 5.

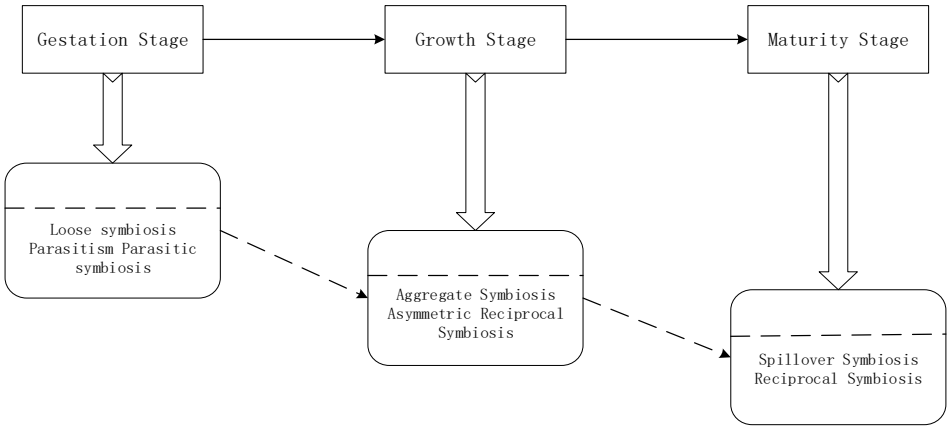


Figure 4. Evolutionary path of the DEE in Dream Town.

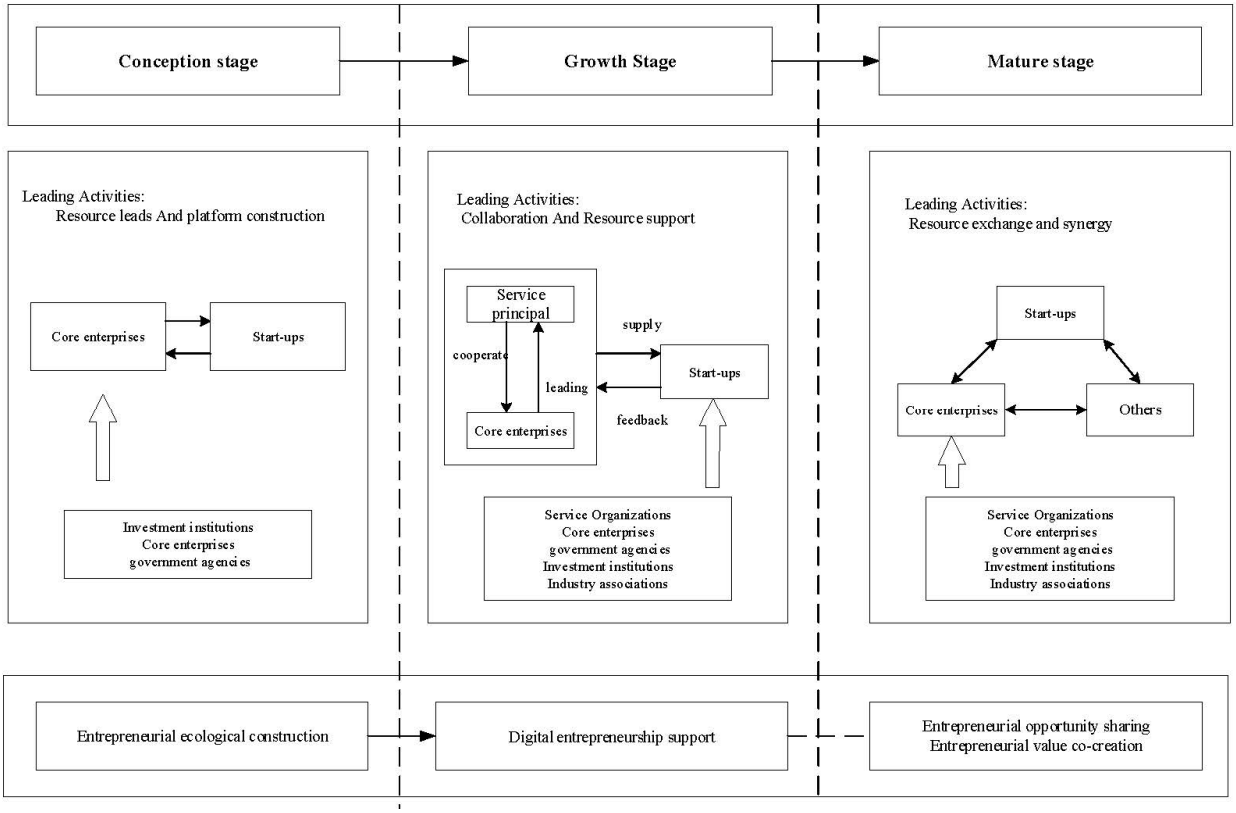


Figure 5. Detailed explanation of the evolution path of the digital entrepreneurship ecosystem in Dream Town.

6.2. Digital Entrepreneurship Network

Digital entrepreneurship networks are mainly collaborative networks between digital subjects (Ritter, 1999) [61]. In the early stage of Dream Town, the digital entrepreneurship network is often formed by the convergence of similar enterprises. On the one hand, it is because digital startups with the same path of business development will converge together because of the geopolitical advantages of Dream Town. On the other hand, digital startups tend to follow established large enterprises and become dependent on them. If too many startups are dependent on one business, an ecological niche overlap may result, resulting in a digital entrepreneurship network. For example, most of the startup bazaars in Dream Town are dominated by Internet startups.

Early digital entrepreneurship networks facilitate digital startups to exchange entrepreneurial resources with each other and promote knowledge flow (Overholm, 2015) [62]. However, as the digital entrepreneurship ecosystem grows, it is difficult for a digital entrepreneurship network formed by a core firm to support too many digital startups. At this time, digital startups will jump from the original digital entrepreneurship network to a new digital entrepreneurship network to find new entrepreneurial opportunities according to NICHE theory. Eventually, the connections between different digital startup networks will gradually close and merge to form a large digital startup network with a larger radiation area. This is shown in Figure 6.

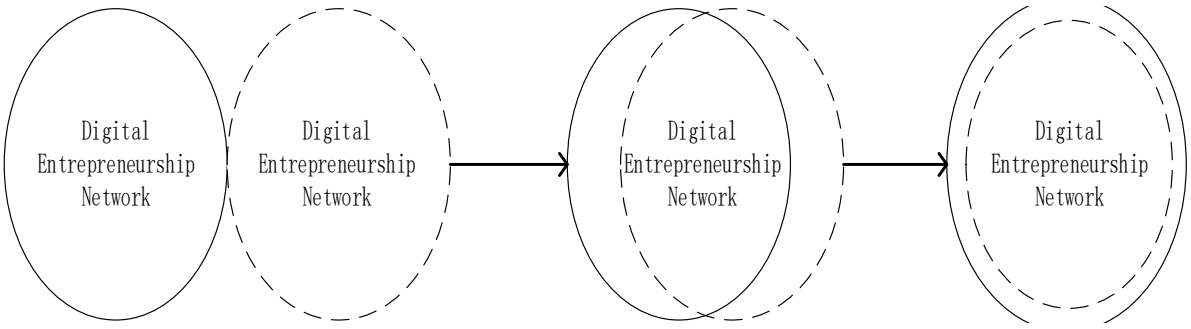


Figure 6. Evolutionary stages of digital entrepreneurship network.

6.3. Digital Entrepreneurial Environment

Dream Town is located in an ecological, scenic area away from the city center, surrounded by beautiful rural scenery, and is an extremely standard "park-like" town (Salerno et al., 2018) [63]. The campus-based construction has given Dream Town access to digital users in nearby university towns, digital enterprises such as Alibaba, and digital technology in the Future Science and Technology City. This was helpful in the early days of the establishment of Dream Town's digital entrepreneurship ecosystem. However, with the gradual improvement of the digital entrepreneurial ecosystem, it became difficult to support the continued development of Dream Town by relying on the nearby industries alone. Thus, the government redesigned Dream Town, building landmark buildings such as Venture Street and Internet Village and bringing Dream Town closer to the city.

In addition, Dream Town also actively built additional business towns and technology parks in the surrounding areas. In addition, Dream Town also introduces successful startups in Dream Town to the surrounding technology parks to accelerate industrialization. Meanwhile, the town's spare space will constantly accept new digital startups. In this way, Dream Town's digital entrepreneurship network has gradually developed from "park-based" to "urbanized".

7. Discussion

With the case of Hangzhou Dream Town, this paper explores the composition and evolutionary stages of the DEE; specifically, the following conclusions are drawn:

(1) The evolution of DEE has obvious self-organizing characteristics. Self-organization refers to the process of a system moving from simplicity to complexity and from roughness to detail, driven by an intrinsic mechanism (Odum, 1988) [64]. In the gestation stage of DEE, the leading role of the government as the creator of DEE is very significant (Cohen, 2006) [18]. It can promote the marketization of DEE through policy help and resource introduction. In the growth stage, the core enterprises will replace the government as the guide of the DEE (Zahra and Nambisan, 2011) [65]. Digital startups will be attracted to the DEE by the core enterprises. At the same time, the core enterprises will have synergistic interactions with the government, investment institutions, and other digital subjects (Nambisan, 2017) [2]. In the mature stage, the self-organizing characteristics of the DEE will be more obvious. As a result, the leading role of the core enterprises will be weakened, and the DEE will have developed a more effective way to transform businesses

(Brown and Mason, 2017) [66]. More importantly, each digital subject will follow the workings of the DEE and develop independently.

(2) Value symbiosis and opportunity symbiosis are critical representations of the operation mechanism of DEE. The operation mechanism of the DEE describes the relationship between digital subjects in terms of relevant connections and mutual influences (Overholm, 2015) [62]. With the development of the DEE, the relationship between digital subjects will change significantly, and this change is mainly reflected in the change in entrepreneurial opportunities and entrepreneurial values (Sussan and Acs, 2017) [4]. Opportunity symbiosis refers to the connections of digital subjects due to entrepreneurial opportunities. Value symbiosis describes the connections of digital subjects due to entrepreneurial values (Meynhardt et al., 2016) [67]; (Alvarez et al., 2015) [59]. The changes in these two connections are the main manifestations of the changes in the operation mechanism of DEE. Among them, there are three stages of value symbiosis: parasitism (biased symbiosis), asymmetric reciprocal symbiosis, and reciprocal symbiosis. There are also three stages of opportunity symbiosis: loose symbiosis, aggregation symbiosis, and overflow symbiosis.

At different stages of the evolution of DEE, opportunity symbiosis and value symbiosis have distinct characteristics. At the early stage of the establishment of DEE, digital entrepreneurial subjects are loosely connected, the degree of development of digital entrepreneurial opportunities is low, and the type of entrepreneurial opportunities is relatively singular (Suddaby et al., 2015) [68]. With the development of DEE, more digital subjects enter the ecosystem, while the degree of development of entrepreneurial opportunities is also improved. Take AliCloud, for example; in the early stage of the DEE, AliCloud focused more on its development and had almost no business connections with other entrepreneurial subjects. After three months in Dream Town, AliCloud began to accelerate the transformation of digital technology and enhance its ability to explore digital entrepreneurship opportunities. Extensive contacts with government, investment, and financing institutions, industry associations, digital incubators, and intermediaries were established. After that, AliCloud became the core company of Dream Town and launched business radiation to introduce startups.

(3) Digital startup networks are formed by the fusion of startup networks formed by multiple core firms (Meyskens et al., 2010) [69]. The core companies can use the entrepreneurial network at the outset of the digital entrepreneurship ecosystem to help other digital startups while attracting more digital startups (Thompson et al., 2018) [7]; (Slotte–Kock and Coviello, 2010) [70]. Core companies lead the digital startup network and explore new directions for entrepreneurship as the leader of the network. According to the case study, most of the core companies will form a digital startup network (Vandekerckhove and Dentchev, 2005) [71]. After this, multiple digital startup networks will be connected and will finally merge into one digital startup network. During this time, digital startups will start to break away from the core companies.

The evolution of digital entrepreneurship networks is divided into embedding and aggregation. Embedding is the beginning of digital entrepreneurship ecology (McKeever and Anderson, 2015) [72]. Core subjects start to explore the construction of the DEE and develop the way of cooperation of multiple subjects from a simple network structure to a complex network structure. Embedding is not an accumulation of the number of digital subjects, but a multifaceted synergy through structure, relationship, and cognition. The purpose is to help digital subjects build a cooperative network to realize business communication. Through the embedding stage, digital subjects form a stable structure of DEE. In the aggregation stage, digital subjects will use the entrepreneurial network to create a series of elemental exchange channels. Digital subjects continuously input entrepreneurial elements into the entrepreneurial network structure (Dyer et al., 2008) [73]. The entrepreneurial elements are integrated into the entrepreneurial process of digital subjects in a dynamic interactive manner. In a word, the fundamental purpose of both embedding and aggregation is to help digital entrepreneurial subjects realize value symbiosis and opportunity symbiosis (McKelvey et al., 2015) [74].

(4) Urbanization will be the best choice for the digital entrepreneurship ecosystem. Urbanization is to establish the DEE in a more peripheral location in the city (Maillat, 1995) [75]. In an analysis of Dream Town, we found that the construction of "urbanization" is helpful for the first stage of the digital entrepreneurship ecosystem. However, with the development of the system, there are problems of geographic remoteness, the low attraction of enterprises, and limited radiation area of users, which are effectively resolved by "urbanization". Specifically, the urbanized DEE has three advantages. (1) First, it is characteristic of China that university cities are commonly established at the edge of cities. Establishing DEEs at the edge of urban areas can not only help college students to find jobs, but also ensure the continuous operation of the system. In addition, urbanization can help digital startups establish partnerships with schools and achieve innovative business development (Karlsson and Andersson, 2009) [76]. (2) Urbanization is neither completely detached from the campus nor close to the city center. This ensures that the digital startup ecosystem has the required environmental, market, and transportation elements. In the future, the DEE can also choose to expand its space to the downtown or suburban areas according to demand. (3) In terms of economic benefits, urbanized construction has clear advantages in terms of rent and subsidies. Digital startups will have a higher probability of success in starting a business here (Goldstein and Drucker, 2006) [77].

8. Conclusions

8.1. Theoretical and Practical Implications

In past studies, scholars have discussed the external environment, subject cooperation, and geographic location of the DEE (Bharadwaj et al., 2013 [3]; Sambamurthy et al., 2003 [78]; Yoo et al., 2010 [79]). They have tried to explain what a DEE is and what elements are included in a DEE. However, they have neglected to think about the DEE from a holistic perspective. This leads to the fact that we do not yet know how the DEE evolves and what the characteristics of the DEE are at different stages of development. Based on existing research, it is also clear that the DEE varies greatly by region and by characteristics (Aminova et al., 2020) [80]. Accordingly, in order to construct a universal framework for the study of DEEs, we urgently need to analyze the evolutionary mechanism of DEEs from a holistic perspective and provide a series of cases that can be studied (Du et al., 2018) [81].

The theoretical value of this study includes the following points: ① Providing relevant cases for the study of the DEE, summarize the evolutionary mechanism of DEE and describe the different evolution stages in detail. This study also constructs a rational framework for the evolution mechanism of DEE to help digital subjects comprehensively understand DEE. ② The study draws on the idea of symbiosis theory, divides the symbiotic relationship between digital subjects into value symbiosis and opportunity symbiosis, and describes them in detail according to development stages, providing a new perspective for the study of synergistic relationships among digital subjects such as government, enterprises, and investment institutions in the digital entrepreneurship ecosystem. ③ The cases selected for this study are China-specific organizational models in which the government has a greater influence upfront, while in other regions such as Silicon Valley and India, the government is less involved than in China (Engel and Del-Palacio, 2011) [82]. So this study provides the theoretical basis for establishing a government-led digital entrepreneurship ecosystem.

The practical values of this study include the following: ① The study provides a detailed analysis of the components and development mechanisms of the DEE. It focuses on the development of DEEs at different stages based on the case study of Dream Town, which shows how these ecosystems can be created in other regions. ② This study provides a powerful tool for digital subjects to understand the organizational form of the digital entrepreneurial ecosystem by revealing the organizational process of the DEE. Especially for digital startups and other investment institutions, our findings enable them to better understand the organizing principles of the digital entrepreneurship ecosystem and thus better realize digital entrepreneurship.

8.2. Limitations and Future Research

Our study has some limitations that may also inspire future research. In our study, we studied a digital entrepreneurship town in Hangzhou, China. Although this case has been developed for many years and has sufficient data to support it, it has some limitations. These limitations include the town having unique factors such as large companies that have been developed in China for many years, and government support. Therefore, our findings cannot be fully applied to other types of business environments, such as corporate-led DEEs. Our future research can focus on multiple cases in different contexts and apply the evolutionary mechanism framework to analyze other DEEs. However, for government-led DEEs, this study has unique theoretical and practical value. This study helps other regions and countries understand the evolutionary mechanism of government-led DEEs and the role of government in the DEE. Most importantly, it can help other regions or countries to quickly build government-led DEEs.

Furthermore, although we have tried to make our findings as inclusive as possible, we must admit that it is difficult to fully and accurately describe the evolutionary mechanism of the DEE. This is due to its extremely long development cycle and the complexity of digital activities. Therefore, we have tried to capture the core subjects and activities that mainly influence the development of the DEE. We can in this way decipher the evolutionary mechanism of the digital entrepreneurship ecosystem. Most importantly, we believe our findings are a good starting point for future research related to government-led DEEs. In the future, we have two main research directions. First, we need to analyze the evolutionary stages of DEEs using more cases from different regions and industries. Second, we need more reliable and refined methods to assess the degree of symbiosis of digital subjects. In this way, we may obtain more generalizable conclusions.

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