

# Research on the Structure, Operation Mechanism and Strategy of Makerspace Based on Entrepreneurial Ecosystems

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**Abstract:** Makerspace is an important practical platform for "mass entrepreneurship and innovation". Based on the entrepreneurial ecosystem, this paper analyzes the structure, characteristics and operation mechanism of makerspace, and concludes that the system structure of makerspace mainly consists of five interrelated elements, namely maker culture, maker ecosystem, capital ecosystem, resources ecosystem and support platform, and maintains ecological equilibrium through the three major operation mechanisms: resource acquisition and integration mechanism, dynamic competition mechanism and value exchange mechanism. Finally, in response to the current problems in the Makerspaces, development strategies for the makerspace are proposed from four aspects: promoting the application of modern information technology, coordinating planning and layout, strengthening policy implementation, and cultivating and promoting the maker culture.

**Keywords:** Makerspace, Entrepreneurial ecosystem, Operation mechanism, Development strategy.

## 1. Introduction

With the rapid development of China's economy and the gradual liberalization of policies, innovation and entrepreneurship has become the choice of more and more people, and the makerspaces, as a new innovation and entrepreneurship service carrier for the general public, is also attracting more and more attention, and it has become one of the important means to promote economic development and innovation drive. In 2015, the government for the first time wrote makerspaces into the work report, followed by a series of policies to support, guide and regulate the development of makerspaces. With the support of government policies and the participation of social capital, there have been major changes and improvements in the number, scale and quality of makerspaces. In the China Business Incubation Development Report (2022) released by the Torch Center of the Ministry of Science and Technology, it is pointed out that there are a total of 9,026 makerspaces in China, with 2,551 makerspaces recorded by the state, 454,000 startups and teams, and a cumulative total of 92,000 entrepreneurial teams and enterprises that have received investment and financing amounting to 772.3 billion yuan [1]. In recent years, the service model of makerspaces has been constantly innovating and upgrading, and their service functions have also been actively expanding. Multiple investment models such as "incubation+investment", social capital participation, and service for equity have been formed, and a "double innovation" agglomeration ecological effect has been formed in key urban clusters such as Beijing Tianjin Hebei, Yangtze River Delta, Guangdong Hong Kong Macao, and Chengdu Chongqing. The makerspace has fully played the leading and demonstration role of "entrepreneurship and innovation", making important contributions to the sustainable development of local construction and entrepreneurship incubation carrier undertakings. However, in the rapid development of makerspace, a series of problems such as outdated technology, weak innovation atmosphere, resource

waste, and imbalanced development urgently need to be solved. In view of this, this article analyzes the structure, characteristics, and operating mechanism of makerspaces based on the entrepreneurial ecosystem, and proposes development strategies for makerspaces, providing theoretical support for promoting the healthy development of the "double innovation" cause and implementing innovative driving strategies in the new era.

## 2. Entrepreneurial Ecosystem of Makerspace

The entrepreneurial system of makerspaces is a gathering of organizations and related environmental support elements closely related to innovation and entrepreneurship centered around the maker in a specific geographical space [2-3]. Within the ecosystem, creators, resources, and culture collaborate to form an interconnected platform with high-quality entrepreneurial services and support, providing entrepreneurs with a solid foundation for successful entrepreneurship, helping startups grow rapidly, and assisting in the landing and commercialization of entrepreneurial projects. Unlike traditional incubators, the maker space has more participants, richer entrepreneurial resources, and closer cooperation and communication among all parties; The maker space emphasizes a culture of sharing and openness, gathering diverse entrepreneurs, entrepreneurial projects, and activities to gather all the resources needed for the innovation and entrepreneurship process. It can provide full process support from creativity to commercialization.

### 2.1. Structure of the entrepreneurial ecosystem for makerspace

From the perspective of entrepreneurship ecosystem, the system structure of maker space is mainly composed of five interrelated elements: maker culture, maker ecosystem, capital ecosystem, resource ecosystem, and support platform.

(1) Maker culture

As the spiritual pillar of makerspaces, maker culture encourages the values of innovation, openness, sharing and cooperation, and creates an inclusive and stimulating atmosphere for innovation, providing a favorable environment for the development of the entire ecosystem. Maker culture can help creators build innovative thinking and entrepreneurial spirit, stimulate their innovative potential, and improve their competitiveness and entrepreneurial success. In addition, maker culture is also an important means to improve the brand image and influence of makerspaces, which can attract more creators and enterprises to move in and increase the brand awareness and market share of makerspaces.

#### (2) Maker ecosystem

The source of vitality of makerspace is the creator ecosystem, which consists of a large number of creators with the willingness and ability of innovation and entrepreneurship, and is characterized by open sharing, innovation-driven, and diversified integration. By renting the office space and facilities and equipment of makerspace, entrepreneurs jointly enter a collective, collaborative and open working environment, where they share experience and resources, and support and help each other. At the same time, the ecosystem of creators is also the customer group of the makerspace, which will provide them with some necessary incubation, acceleration, investment and financing support, and assist their enterprises to complete the transformation from concept to business.

#### (3) Capital Ecosystem

The capital ecosystem consists of top-tier resources and investment organizations, aiming to provide financing support and investment opportunities for entrepreneurs, promote rapid development of enterprises, and promote high-quality development of science and technology innovation and entrepreneurship. The capital ecosystem usually includes angel investment, venture capital, private equity and other investment methods. Makerspace can utilize the resource advantages of investors to build an entrepreneurial platform for entrepreneurs to realize the initial development of enterprises with minimal cost and risk. At the same time, investors can also use the platform of makerspace to quickly obtain high-quality projects, make investments and get returns after the enterprises are successful. Meanwhile, the capital ecosystem also leads the direction of innovation and entrepreneurship development, guiding enterprises to focus more on technological innovation and value creation. The construction of the capital ecosystem enables entrepreneurs to better utilize the resources of the capital market, enhance their competitiveness and innovation ability, and promote the healthy development of the entire entrepreneurial ecosystem.

#### (4) Resource ecosystem.

The resource base of the makerspace is the resource ecosystem, which mainly consists of two categories: corporate service organizations and partners. Corporate service organizations, such as law firms, accounting firms, marketing planning companies, etc., can provide entrepreneurs and startups with knowledge, technology, capital, legal services and other related resources, giving them valuable service support and helping them to better carry out their business. Partners include governments, universities, science and technology parks, investment organizations, large enterprises, etc., which provide infrastructure, ancillary services, policy support and other related resources to inject

new resources and momentum into the entrepreneurial ecosystem of the makerspace, expanding the coverage of the ecosystem and promoting its rapid development.

#### (5) Support Platform

As a key component in the entrepreneurial ecosystem, incubators, makerspaces, gas pedals and other service organizations within the support platform help startups grow and enter the market quickly and increase the success rate by providing entrepreneurs with entrepreneurial support in the areas of office space, materials and tools, technical consulting and marketing, thus promoting high-quality development of science and technology innovation and entrepreneurship. In a makerspace, multiple service organizations work in synergy to promote the development of the entire ecosystem [4].

## 2.2. Characteristics of entrepreneurial ecosystems in makerspace

As the main carrier of the mass entrepreneurship level in the social entrepreneurship promotion system, makerspace is an all-round comprehensive entrepreneurial ecosystem with diversified characteristics in promoting mass entrepreneurship, and its importance is self-evident [5].

(1) Participating subjects are wide. Makerspace entrepreneurial ecosystem is diversified, in this ecosystem, entrepreneurs, investors, entrepreneurial projects of different natures, different industries and different scales gather together, interact and influence each other, and can provide more comprehensive entrepreneurial support as well as more opportunities and resources.

(2) Multi-party cooperation. The entrepreneurial ecosystem of makerspace is a partnership between multiple organizations, businesses, and government agencies. These organizations can provide startups with a variety of resources and support, such as funding, mentors, legal services, and market channels, thereby assisting startups to survive and thrive in a competitive market.

(3) End-to-end support. The startup ecosystem of makerspace provides full-process support from idea to commercialization. Entrepreneurs can access the latest business knowledge and technical advice through incubators, gas pedals, and other facilities in the makerspace.

(4) Openness and sharing. The Makerspace entrepreneurial ecosystem emphasizes a culture of sharing and openness, and it is open not only to entrepreneurs but also to other businesses and organizations. Entrepreneurs can access the experience, skills and resources of other entrepreneurs and network and collaborate with other entrepreneurs. This culture of openness and sharing helps foster innovation and collaboration, and helps businesses grow and develop faster.

(5) Industry-led. The entrepreneurial ecosystem of makerspace has a certain industry chain-driven role, and the entrepreneurs, entrepreneurial teams, and entrepreneurial projects in this ecosystem are mainly oriented to technological innovation or product innovation. They constantly explore new technologies and new business models, which can promote the development and innovation of related industries or fields.

## 3. Analysis of the Operating Mechanism of The Entrepreneurial Ecosystem of Makerspace

The operation mechanism of makerspace refers to the

structure, function, and interrelationship between different innovation elements, as well as the way and principle in which these elements play a role within the whole system [6]. There is an inherent logical correlation and mutual influence between different elements, and through an efficient operation mechanism, makerspace can provide more efficient entrepreneurial support. The entrepreneurial ecosystem of makerspace mainly contains three major mechanisms, namely: resource acquisition and integration mechanism, dynamic competition mechanism and value exchange mechanism.

### **3.1. Resource Acquisition and Integration Mechanism**

Entrepreneurship is a difficult and complex process, entrepreneurs are often faced with a variety of challenges and difficulties, relying solely on their own resources, almost unable to achieve the entrepreneurial goals, therefore, new entrepreneurial service platforms such as crowdsource space came into being. Makerspace is the evolution of the "makerspace + business incubation" model, which has a good reputation and competitive advantage at the beginning of its creation [7]. The entrepreneurial ecosystem of the makerspace is based on the big data resources and computing power of the Internet, and has the function of finding and connecting resources for innovation and entrepreneurship. Among them, the process of resource finding reflects the resource acquisition mechanism of the makerspace, while the docking process reflects the resource integration mechanism of the makerspace. In the resource acquisition stage, makerspaces gather entrepreneurial projects and high-quality resources from all walks of life for creators by actively cooperating with local governments, obtaining top industry-academia-research resources from universities and other institutions, obtaining funds from financial institutions, and introducing various entrepreneurial service providers to provide intermediary services, and, at the same time, establish a comprehensive and convenient resource ecosystem for their partners. In the resource integration stage, after evaluating the entrepreneurial projects in the resource ecosystem, the makerspace connects the entrepreneurial ecosystem with the resource ecosystem, i.e., it matches the entrepreneurs with corresponding resources and services in daily management, entrepreneurial knowledge, professional guidance (material, talent, information) according to their needs, so as to scientifically assist in the incubation and growth of the entrepreneurial projects.

### **3.2. Dynamic competition mechanism**

The dynamic competition mechanism of the ecosystem refers to the "input-output" and "survival of the fittest" of the two ecosystems of creators and resources [8]. Through the dynamic competition mechanism, on the one hand, it can strictly control the entrance gate and realize the attraction of high-quality resources; on the other hand, it can eliminate a part of the creators and resource organizations that lack vitality and are not conducive to the efficient use of resources in the entrepreneurial ecosystem, thus realizing the stable operation of the entrepreneurial ecosystem of crowdsourced creative space. In terms of the ecosystem of creators, creators are the core of the ecosystem of makerspace, and are the power source to promote the innovation and entrepreneurship vitality and development of makerspace. The ecosystem of creators is characterized by open sharing, innovation-driven and diversified integration, etc. Although creators can enter

and exit the makerspace relatively freely, there still exists hidden competition against the background of such loose freedom, which mainly focuses on the stages of creative incubation, technology research and development, capital investment and financing, and entrepreneurial support. In this process, creators usually show their creativity through various forms of competitions, roadshows, exhibitions, etc., while continuously learning new technologies and using various digital tools to improve their competitiveness and core technological capabilities, and only those creativity with high market value can get the attention and support from investment institutions, industrial experts, etc. Through different stages of screening, creators with high-value ideas in the creators' ecosystem stay and those with poor value ideas leave, thus promoting the development and innovation of the creators' ecosystem. In terms of the resource ecosystem, the resource boundaries of the makerspace for the society are open, and there is transparent resource interaction with the society in terms of venues, equipment, talents, funding, market, training, innovation, socialization, and so on. In order to obtain stable high-quality resources, makerspaces will be screened through a three-tier mechanism of threshold selection, market competition and performance evaluation. First is the threshold selection mechanism. Makerspaces have strict regulations on the threshold of admission, entry conditions and code of conduct, etc. Only resource organizations that meet the conditions are qualified to participate in the competition. Then there is the market competition mechanism, after the threshold selection is completed, resource organizations with complementary functions and entrepreneurial projects are automatically paired, while other resource organizations that are not successfully paired often adopt market rules such as directional invitations and bidding to compete. Finally, there is the performance evaluation mechanism, which is a comprehensive assessment of the performance of resource organizations in the competition. The space operator regularly conducts dynamic assessment on the resident resource organizations, and those with excellent performance can obtain more market opportunities, while those with poor performance are required to rectify or be eliminated by a deadline. Through these three mechanisms, the resource ecosystem is promoted to continuously innovate and quickly respond to market demands in order to maintain competitive advantages, thus maintaining the ecological vitality and dynamic optimization of the ecological resource base of the makerspace.

### **3.3. Value exchange mechanism**

The value exchange mechanism of the entrepreneurial ecosystem of the makerspace refers to the process of resource sharing, complementary advantages and value appreciation between various subjects such as entrepreneurs, entrepreneurial service providers and investment institutions within the makerspace through various exchange methods and exchange relationships [9]. This mechanism can promote collaborative innovation and win-win cooperation among various subjects within the makerspace and promote the sustainable development of makerspace. In the entrepreneurial ecosystem of makerspace, the value exchange mechanism is mainly embodied in the following aspects: first, resource sharing, makerspace, as a place to gather entrepreneurs and share resources, provides, for example, office space, meeting rooms, network equipment and other

kinds of facilities and services, which help entrepreneurial enterprises to save costs and improve efficiency. Entrepreneurs can obtain resource support by leasing these facilities and services, and at the same time pay the corresponding service fees, realizing a win-win situation. Secondly, entrepreneurial guidance and technical support. Makerspaces can also provide entrepreneurial enterprises with professional entrepreneurial guidance and technical support services in entrepreneurial training, financing services, marketing, legal counseling, talent recruitment and so on. These supports can help startups do business better and improve entrepreneurial success rate and entrepreneurial performance, while the entrepreneurs will also pay a certain amount of consulting fees or return to the entrepreneurial ecosystem in the form of proportional dividends. Third, community co-construction, in which entrepreneurs have the opportunity to communicate with each other, collaborate and innovate, and work together to advance their businesses in the system. This community co-construction can promote cooperation among enterprises, strengthen the interaction and communication of the ecosystem, and increase the cohesion of the ecosystem. Fourth, return on equity investment, whereby the investor participates in the development of the enterprise by making equity investment in the entrepreneurial team and receives a return when the enterprise achieves success. In addition, it is also possible to realize the return of the enterprise to the makerspace in the development process by leaving part of the equity to the makerspace operator. After the success of the entrepreneurial team, more high-quality projects and talents will converge to the makerspace, further enhancing the value of the whole ecosystem. In conclusion, the value exchange mechanism of the entrepreneurial ecosystem of the makerspace is a complex exchange relationship and exchange method, which requires synergistic cooperation and benign interaction between various subjects within the makerspace. Only through an effective value exchange mechanism can the sustainable development and value-added value of the makerspace be realized.

## **4. Strategies for the Development of Makerspace**

Makerspace is an important means to promote economic development and innovation drive, and it is especially important to adopt appropriate strategies and policies to promote its development. Through the theoretical study and practical research on the entrepreneurial ecosystem of makerspace, the following four aspects can be taken to promote the future development of makerspace.

### **4.1. Promote the application of modern information technology**

With the rapid development of the Internet, the application of modern information technology is also advancing and improving, but some of the makerspaces are still stuck in the past mode, lack of innovation and change, and are unable to provide targeted, differentiated and specialized services. Makerspaces can realize smart offices and promote the healthy development of the ecosystem by promoting digital transformation and making full use of artificial intelligence technology. (1) Digital transformation refers to the application of digital technology to all levels of an enterprise, including business models, customer experience, processes and operations, with the help of data to drive intelligent

workflows and decision-making. In makerspaces, digital transformation can help creators carry out innovation and entrepreneurial activities more effectively and improve productivity and user satisfaction. For example, digital transformation can improve the efficiency of communication and collaboration among teams by establishing IT systems based on cloud computing and big data analysis to achieve automation and digital management and collaboration; at the same time, digital transformation can also improve the competitiveness of entrepreneurship and market share by establishing digital products or services to meet the growing personalized needs of consumers. (2) Artificial Intelligence, on the other hand, is a technology that simulates human intelligence and solves complex problems by allowing machines to learn and adapt to their environment automatically. In makerspaces, AI can be used to accelerate technological innovation and improve entrepreneurial efficiency. For example, AI can provide startups with more decision-making support by automatically learning and adjusting during the startup process and identifying consumption trends and market changes based on the results from data analysis; meanwhile, AI can also improve user experience and adhesion, and enhance brand influence and competitiveness by enhancing the intelligence of products or services.

### **4.2. Focus on integrated planning and layout**

There is an imbalance in the development of crowdfunding spaces across the country. Developed first- and second-tier cities such as Beijing, Shanghai, and Shenzhen have strong development and high distribution density of crowdfunding spaces due to their obvious advantages in economy, science and education, and industry, while the construction of crowdfunding spaces in central and western cities is relatively weak due to factors such as insufficient innovation drive. The development imbalance may lead to a vicious circle of regional economic development as well as differences in resources and services, which will increase the probability of entrepreneurial failure and reduce the quality of science and technology innovation. For the phenomenon of regional development imbalance, we should focus on the integrated planning and layout, which can be done in the following aspects: (1) Formulate differentiated policies. Differentiated policies should be formulated for the development status of different regions, for example, more policy support can be given to relatively weak economic regions, such as capital subsidies, tax incentives and so on. (2) Strengthen infrastructure construction. Increase the investment in infrastructure construction of the makerspace, such as providing a better network environment, transportation facilities, public services, etc., to provide entrepreneurs with a better working environment. (3) Promote entrepreneurship and innovation education. By promoting entrepreneurship and innovation education, improve people's innovation awareness and quality, and promote more people to join the team of innovation and entrepreneurship, so as to promote the development of local entrepreneurship and innovation atmosphere. (4) Establish a collaboration platform. Establish a collaboration platform so that entrepreneurs and entrepreneurial enterprises in different regions can communicate and collaborate with each other, share experiences and resources, and jointly promote the development of innovative enterprises. (5) Improve administrative efficiency. Accelerate the speed of

administrative approvals, streamline administrative procedures, and reduce the cost of doing business, so as to provide entrepreneurs with a better investment environment and development space.

### 4.3. Strengthening the implementation of policy promotion

As some local governments destroy the level playing field in order to achieve the performance appraisal goal, they forcefully promote some poor-quality makerspaces to enter the market, and even have the behavior of seizing policy funds, which makes it difficult for some enterprises to obtain substantial help and support, and results in the waste of national and local policy resources. To solve such problems, we can start from the following aspects. First, government departments should guide all local governments to fully understand the significance and role of the development of crowdsourcing spaces, strengthen their knowledge and understanding of crowdsourcing space construction, and pay attention to the quality and benefits instead of merely pursuing quantitative indicators to avoid excessive achievement. Secondly, it is necessary to establish a sound regulatory mechanism to supervise and provide timely feedback on the construction of Makerspace. For those makerspaces that do not meet the requirements, they should be rectified or closed down within a certain period of time. Third, for those makerspaces that meet the standards, government departments should increase policy support for outstanding makerspaces, and at the same time, they should focus on quality improvement and encourage them to strengthen their internal management, improve their competitiveness and service capacity building, so as to make them really become a good platform for entrepreneurs to develop. Fourth, government departments should establish a strict exit mechanism for those Makerspaces whose service quality and management level are not up to standard, so as to avoid wasting resources and jeopardizing the interests of entrepreneurs. Fifth, government departments encourage makerspaces to cooperate with each other and realize complementarity of advantages through resource sharing and information exchange, so as to jointly build an innovation ecology and enhance the actual utilization value of makerspaces.

### 4.4. Cultivate and promote maker culture

While strengthening its own capacity and management level, it is more important for makerspaces to create an innovative atmosphere of sharing and collaboration, encouraging innovation and tolerating failure in the society. Maker culture plays a very crucial role in makerspace, which guides the whole process of innovation and entrepreneurship. Well-known foreign makerspaces regularly organize various forms of exchanges and sharing, entrepreneurial roadshows and other activities to create an atmosphere of innovation and entrepreneurship in the society, so as to strengthen the knowledge training and cultural dissemination of innovation and entrepreneurship. In contrast, China still needs to make further efforts in this aspect, which requires the joint efforts of all sectors of the society to create a strong atmosphere of maker culture. For example, colleges and universities should

focus on the development of students' innovation and entrepreneurship spirit and practical ability in curriculum and teaching methods, and encourage students to participate in various innovation and entrepreneurship projects and social practice activities. At the same time, colleges and universities should promote the union of industry, academia and research, and through close cooperation with the industry sector, transform scientific and technological achievements into commercial projects, so as to enhance the technical level and market competitiveness of schools and enterprises. Innovative enterprises can formulate practical incentive policies based on the actual performance and contribution of their employees. The government can introduce a series of entrepreneurship support policies, such as tax breaks, guaranteed loans for business start-ups, and the issuance of business vouchers, to provide entrepreneurs with financial and resource support, and the policies need to be publicized more intensively after their introduction. Makerspaces and innovative enterprises should strengthen publicity and organize activities such as inviting entrepreneurs to talk about their entrepreneurial experiences and share their entrepreneurial journeys, so as to stimulate the community's enthusiasm and interest in entrepreneurship.

## References

- [1] Torch High tech Industry Development Center of the Ministry of Science and Technology. China Entrepreneurship Incubation Development Report 2022[M]. Science and technology documentation press: 2023.
- [2] Sun Ronghua, Zhang Jianmin. Research on Mass Creative Space Based on Entrepreneurial Ecosystem: A Research Framework[J]. Science and Technology Management Research, 2018, 38(01):244-249.
- [3] Xiang Yongsheng, Gu Jiajun. Research on New Type of Group Innovation Space Building based on Entrepreneurial Ecosystem[J]. Science & Technology Progress and Policy, 2017, 34(22):20-24.
- [4] Liu Zhiying, Wu Lin. Crowd — innovating space: Theory origins and research perspectives[J]. Studies in Science of Science, 2018, 36(03):569-57.
- [5] Chen Su, Xiang Liyao, Yu Rongjian. Co-maker Space Entrepreneurship Ecosystem: Features, Structure, Mechanism and Strategy-Case Study on Hangzhou Dream Town[J]. JOURNAL OF BUSINESS ECONOMICS, 2015, (11):35-43.
- [6] Jia Tianming, Lei Lianghai, Wang Maonan. Maker-space Ecosystem: Content, Characteristic. Construction and Operation Mechanism[J]. Science and Technology Management Research, 2017, 37(11):8-14.
- [7] Wang Youmei, Ye Aimin. From Maker Space to Co-Maker Space: A Functional Model and Service Path Based on Innovation 2.0[J]. e-Education Research, 2015, 36(11):5-12.
- [8] Cai Youhua, Meng Qiuyu, Chen Guohong. Research on the Evolutionary Game of Cooperative Innovation in the Core Firm-led Makerspace from the Perspective of Value Co-creation[J]. Chinese Journal of Management Science, 2019, 39(17):1-6.
- [9] Wang Qun. The Construction of the Entrepreneurial Ecosystem for Co-maker space [J]. Enterprise Economy, 2016, (10):5-9.