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Evolutionary Mechanisms for Digital Innovation Ecosystem and Value Co-Creation and Co-Sharing -Based the Perspective of Dynamic Capabilities and Resource Orchestration

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Abstract: Under the call of common wealth and corporate social responsibility, the construction of digital innovation ecosystem by enterprises through the integration and optimisation of digital resources has become an important act to achieve value co-creation and co-sharing in the digital era. Taking Huawei as an example, we explore the evolution path of enterprise digital innovation ecosystem. The study finds that enterprises build their digital innovation ecosystems through "digital environment perception capability, digital resource orchestration capability, resource advantage co-creation capability, and value co-sharing ecological capability". According to the division of the digital transformation stage, enterprise innovation ecosystem mainly divided into incubation stage, growth stage, and maturity stage; As the enterprise digital innovation ecosystem evolves, a theoretical model of "resource cooperation-resource co-sharing-resource empowerment "will eventually be formed.

1. Introduction

New Productive Force is dominated by innovation, which believes that enterprises have to go beyond the traditional value creation capacity to form a brand new development power. At the same time, under the social governance pattern of "common construction, common governance, and common sharing" vigorously promoted by the state, enterprises have closed innovation mode, and the innovation ecosystem, which aggregates core enterprises, suppliers, government and other multi-stakeholders, and collaboratively evolves through sharing innovation resources and common value creation, has come onto the stage of history. At the same time, new digital technologies are reconfiguring the new form of enterprise development, enterprises actively use digital resources for innovation and change, forming a digital innovation ecosystem based on digital resources and digital technology[1].

In the innovation ecosystem, the partner-based value co-creation mode becomes the main way of enterprise value creation. It has been shown that innovation ecosystem can realise value sharing

through the means of resource arrangement. It is worth noting that the realisation of shared value is equally important for enterprises and society. Scholars have argued that the essence of the goal of enterprise financial management is to realise value co-creation and value co-sharing. The creation and sharing of enterprise value is the basis for the coexistence of stakeholders. In a digital innovation ecosystem, the realisation of benefit sharing among innovation actors can improve the utilisation of innovation resources, and at the same time can bring broader benefits to innovation actors[2].

Based on this, the study from the perspective of dynamic capabilities, combined with the different stages of enterprise digital transformation, to explore how to build a typical and representative innovation ecosystem and realize the value of value co-creating and co-sharing, and try to provide reference to the construction of digital innovation ecosystems by enterprises. This is an attempt to provide a reference for enterprises to build digital innovation ecosystems.

2. Literature Review

2.1 Digital innovation ecosystem

The ecosystem was originally a biological category. Ander (2006)[3] broadened the scope of participants in the ecosystem value chain and innovation ecosystems emerged. With the continuous development of the digital economy era, digitalisation has reshaped the way of value co-creation between innovation subjects (Xie et al.,2023)[4], research on innovation ecosystems based on digital resources has gradually emerged. Digital innovation ecosystem is the fusion of "digital innovation" and "innovation ecosystem" (Nambisan,2018)[5], and is a social-ecological system formed by digital innovation-related industrial entities based on competitive relationships (Beltagui et al.,2020)[6] .

The use of digital technology and digital resources is a capability for the development of corporate innovation ecosystems (Li and Liu,2024)[7]，digital technology innovation capability, digital technology digestion and absorption capability, and resource integration cost are key factors affecting innovation ecosystems (Ji et al.,2023)[8]. Innovation ecosystem resources and innovation ecosystems can moderate the positive relationship between digital transformation and digital technology innovation capability, as well as the mediating effect of digital technology innovation capability (Men et al.,2023)[9].The formation of digital innovation ecosystems does not happen overnight.

2.2 Value co-creation and co-sharing mechanism

In the innovation 3.0 era, more and more enterprises are working together to build innovation ecosystems to achieve value co-creation. Each participant in the innovation ecosystem promotes the aggregation and integration of resources through cross-border collaboration, and jointly creates the value of the ecosystem (Yang, 2024)[10]. The value of the ecosystem is jointly created[11].

The concept of value co-creation originates from the private sector, focusing on the interaction of subjects in the value chain to realise value (L. S V and F. R L,2024)[9]. The underlying logic behind corporate value co-creation is one of mutual benefit, a single mode of operation or governance mechanism does not facilitate ecosystems to achieve value co-creation, the proportion of sharing and the degree of incentives are positively correlated with value co-creation benefits(Li and Liu,2024)[7], therefore, companies need to establish mechanisms with clear responsibilities, rights and benefits when choosing partners (Chen et al.,2021)[12] . The innovation ecosystem is the construction and evolution from value proposition to value creation and then to value sharing. In the innovation ecosystem, the logic of innovation competition among enterprises has shifted from competition logic to value co-creation and symbiosis logic.

2.3 Literature review

Based on the above review of the existing literature, it can be found that: firstly, the existing research ignores the importance of value sharing in the entire innovation ecosystem.Second, most of the studies on value co-creation and co-sharing in digital innovation ecosystems have only explored the formation mechanism from a static perspective, ignoring the dynamic evolution behavior of enterprises. Therefore, the study tries to examine the whole process of enterprise digital innovation ecosystem construction, dig deeper into the behaviours of enterprises to achieve value co-creation and sharing, and summarize the hidden problems and laws behind them.

3. Study design

3.1 Choice of research methodology

The article focuses on the evolution process of value co-creation and co-sharing in enterprise digital innovation ecosystems, starting from the driving factor (why) through the resource orchestration behaviors of how to influence the enterprise value co-creation and co-sharing mechanism to form digital innovation ecosystems (what), the use of a single-case study facilitates the generalization and summing up of the laws. Meanwhile, coding analysis using rootedness theory can help understand the process of building digital innovation ecosystems by discovering how case enterprises build digital innovation ecosystems to achieve value co-creation and co-sharing through conceptual pointing, change, and saturation.

3.2 Case selection and data collection

Following the principles of typicality, representativeness and inspiration of case analysis, according to the research theme and the principle of theoretical sampling, Huawei was selected as the research case enterprise. First of all, in the process of enterprise development, Huawei builds a symbiotic, co-creating and win-win ecosystem by aggregating the open ecology of partners and developers,In line with the typical principle of case selection. Second, the case company is representative. Huawei has always adhered to open innovation and has a high representativeness in the industry, leading the development of the industry. Thirdly, the case enterprise is instructive. As an industry leader, the construction of Huawei 's innovation ecosystem has guiding significance for enterprises in the industry[13].

The research data included both primary and secondary data. The data sources and processes are organized as shown in the table1.

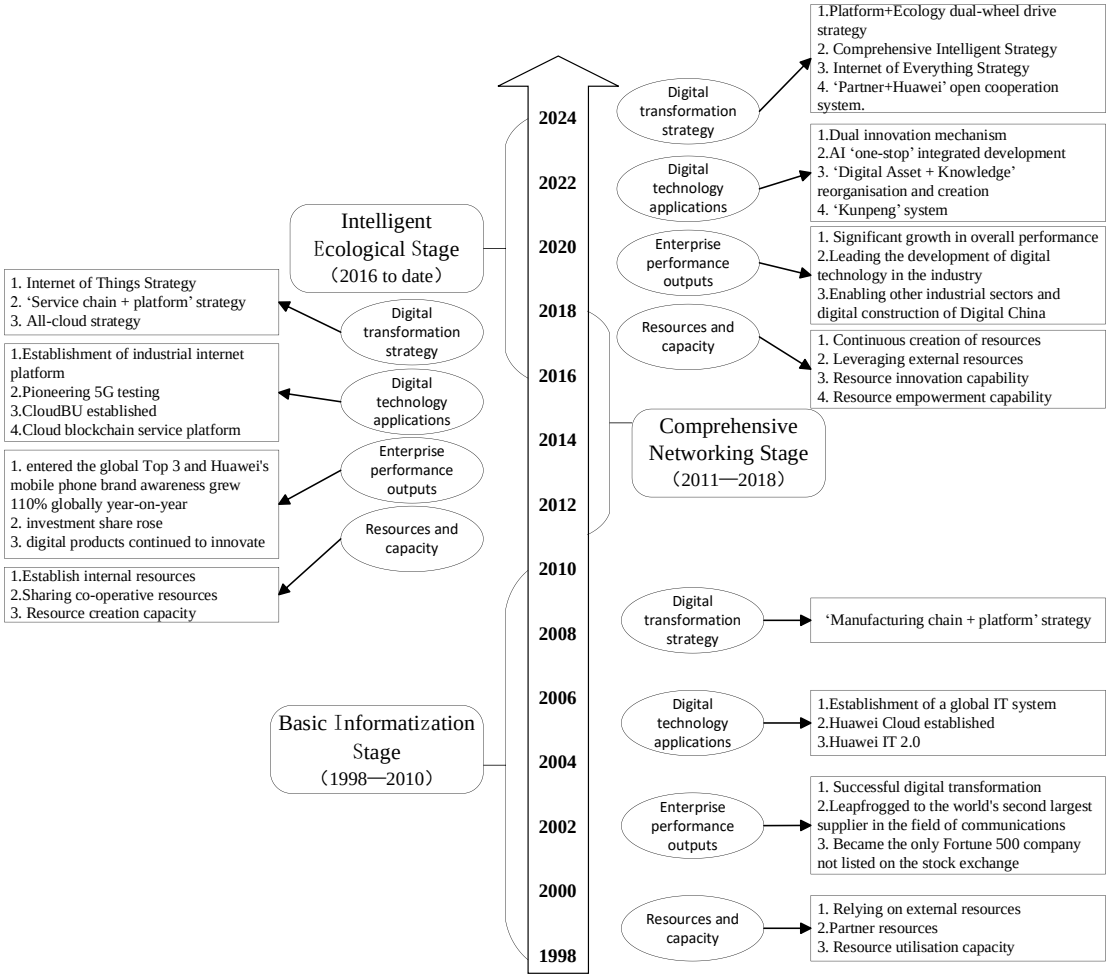
Table 1 Data sources and collation

Source: Authors own work

data type	Time of data source	Data acquisition process	Manuscripts/10,000 words	encodings
primary source	February 2024-June 2024	Conducted thematic interviews with Huawei's management team, technology R&D department, marketing department, personnel department and production department.	5.1	FT
Used information	1998-2024	Enterprise official website, annual report, public website	3.8	NB
	2016-2024	Media reports, China Knowledge	2.9	WB

3.3 Stages of digital transformation

Drawing on Wu 's (2024)[14] scholar's approach to the division of digital transformation phases, combined with the specifics of the selected case, Huawei's digital transformation phases are divided into three phases: basic informatization, comprehensive networking, and intelligent ecology, based on the four dimensions of digital transformation strategy, application of digital technology, enterprise performance, and required resources and capabilities. As shown in Figure 1. Among them:

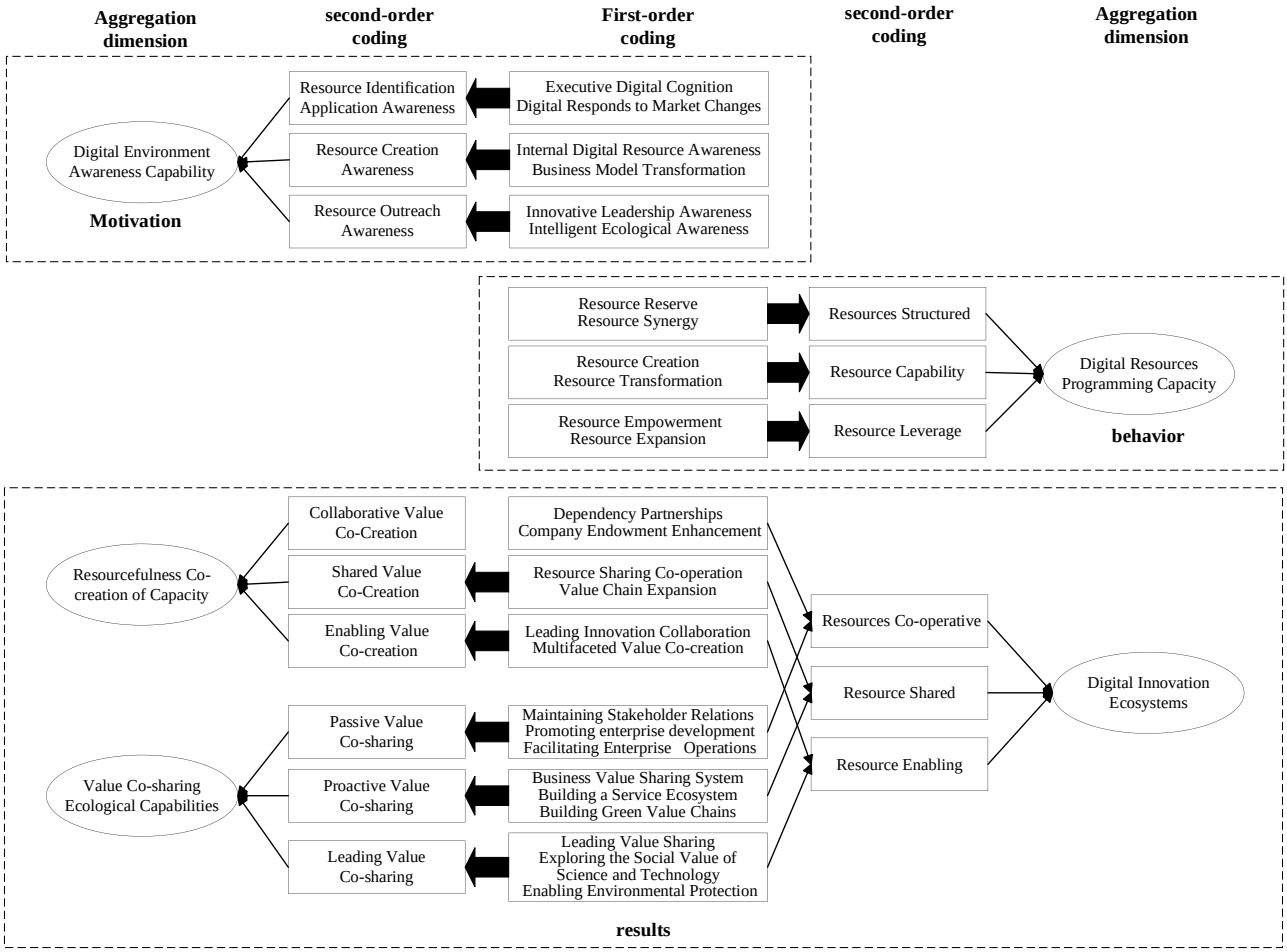


Source: Authors own work

Fig. 1 Stages of digital transformation

3.4 Data analysis and coding

This paper encodes and summarizes the data through classical grounded theory. Firstly, the collected data are sorted out, and the overall reading is carried out after the preliminary coding according to the source, and the relevant data are screened out for open coding. After summarizing the essentials, the first-level coding is carried out and the first-level coding items are extracted. Secondly, through the spindle coding, the first-level coding is summarized, and the corresponding second-level concepts are extracted. As shown in Figure 2.



Source: Authors own work

Fig. 2 Data structure

4. Case studies

4.1 Basic Informatization Stage (1998-2010)

4.1.1 Digital Environment Perception Capability

Digital cognition of executives: In the early stage of development, Huawei executives realized that it was necessary to improve the original process through digital transformation. In addition, in 2002, the Internet experienced a recession, Huawei at this time the development of the crisis, the transition to continue to become a major choice at that time, and Ren Zhengfei in the elimination of all the difficulties and still chose to change the digital transformation to the end, precisely because of the beliefs and behaviors of sticking to the end of Huawei's digital transformation in 2008 to achieve success.

Digital response to market changes: At the beginning of the digital transformation,Huawei finally selected IBM.IBM through the understanding of Huawei’s development of a five-year strategic plan, and it is through this plan to IT support the international market, began overseas layout. Through this plan, Huawei was able to move into the international market with the support of IT and start its overseas layout. With the wave of big data sweeping across the globe, Huawei is further digitizing its

products, focusing its investment on 5G R&D, cloud computing, and other areas to meet market challenges through digitization and keep pace with the development of data.

4.1.2 Digital Resource Orchestration Capability

Resource reserve: To overcome the limitations of existing resources, Huawei began to introduce resources, successively introducing the IPD process and the ISC model, and making changes to product R&D and supply chain management by taking the external model as the standard and combining it with its own situation. In this process, Huawei has continued to accumulate resources, such as the establishment of a security certification center in the UK in 2010 and the voluntary signing of an energy-saving agreement, all of which show that Huawei has continued to accumulate resources.

Resource synergy: On the one hand, continuously searches for partners and establishes cooperative relationships, such as establishing a joint venture with 3Com in 2003, establishing a joint venture with Siemens in 2004, and establishing a joint research and development center in Shanghai with Motorola in 2006; on the other hand, Huawei actively cooperated with IBM and carried out IPD/ISC/finance under the guidance of IBM. The four unified business changes are carried out under the guidance of IBM.

4.1.3 Resource Advantage Co-Creation Capability

Dependence on partnerships. In the foundation stage, Huawei cooperates with 3Com on enterprise data network solutions, with Siemens on TD-SCDMA solutions, and with Motorola on UMTS technology. As Huawei completed its Chinese-style business battle to gain a foothold in France, this could not have been achieved without cooperation with government agencies and high-level Chinese-French interfaces. The main members of the innovation ecosystem at this point in time are core companies, technology joint ventures, and government and related organizations.

Enhancement of company endowments. Huawei 's initial digital transformation in 2008,, annual sales of US$30 billion in 2009, and becoming the only Fortune 500 company not to be listed in 2010, while economic benefits could not be achieved without improved technological capabilities. Over 10 years, Huawei's research and development cycle has been reduced by half, the failure rate has been reduced by 95%, and supply chain processing efficiency has increased by 35%.

4.1.4 Value Co-sharing Ecological Capability

Enterprise value sharing in the basic information technology stage is mainly driven by enterprises to share value to obtain enterprise benefits from digital transformation and belongs to the Passive value sharing stage. Passive value sharing means that enterprises rely on the results of value co-creation and promote value sharing for the next stage of enterprise value creation and the enhancement of enterprise benefits.

Huawei shares economic value by establishing a supply chain process-sharing platform and employee equity-sharing system. Huawei has always incentivised its employees through its employee shareholding system, which is constantly adjusted to maintain the vitality of the entire organisation. In addition, Huawei promotes corporate development by emphasizing customer awareness and strengthening cooperation and communication, placing the realization of customer values at the center of its business philosophy and constantly innovating; it also promotes exchanges between the Chinese and French governments and the development of French small and medium-sized enterprises (SMEs) in China when it conducts its telecom business in France. Finally, Huawei facilitates business operations by reducing energy consumption and building a green and energy-efficient communications network, while realising eco-value sharing.

4.2 Comprehensive Networking Stage (2011-2018)

4.2.1 Digital Environment Perception Capability

Internal Digital Resource Awareness: In 2012, Huawei established its own unique MES system; by 2015, Huawei was faced with the problem of the data silos formed by one of its own IT systems, and it began to have the idea of improving the competitiveness of the enterprise with digitalisation. Business Model Transformation: At this stage, Huawei searched for a transformation strategy that suited its own needs, and placed the opportunity in the consumer business represented by smartphones. At the same time, the enterprise actively transformed its business model, changing the traditional B2B model to a more consumer-oriented B2B and B2C model.

4.2.2 Digital Resource Orchestration Capability

Resource creation: Huawei combines internal and external resources to form flexible resources, such as creating an innovative research platform and developing a big data platform. Huawei has also actively adjusted its digital strategy, proposing a "cloud, pipe and end" strategy in 2011, believing that to achieve digital transformation, it must rely on the cloud to handle the data connected to the end, and extend it to the enterprise business and consumer areas to develop the "cloud, pipe and end" in a collaborative manner.

Resource transformation: Through the activation of internal and external resources, Huawei gives full play to resource efficiency. Through the establishment of the Global Financial Risk Control Centre, the commercial deployment of LTE, the release of the S12700, and the participation in global standards and open source organisations, Huawei has expanded its corporate functions and developed the corporate value chain. In addition, Huawei has spread its resources throughout other fields, establishing smart city solutions, safe city solutions, omni-channel banking solutions, and so on, covering a wide range of fields.

4.2.3 Resource Advantage Co-Creation Capability

Resource-sharing co-operation. As early as 2015, Huawei actively sought out ISV partners to promote the development of "joint solutions".Huawei not only innovates its enterprise business, but also carries out digital innovation reforms in other areas, creating a government big data alliance with ecological partners, complementing the strengths of technical service enterprises, creating financial ecological solutions, and creating a joint operation model to realise the sharing of resources with partners.

Value chain expansion. In 2016, Huawei's IOT solutions enabled smart homes .Huawei has also carried out technological resources to help in the areas of smart parking and smart cities to achieve the sharing of business value. In addition, Huawei is committed to solving industry challenges, eliminating the digital divide through digital technology innovation. Lastly, Huawei continues to innovate in green technologies. Its mobile phone products have received the highest level of green certification. Huawei uses clean energy power in the production process, and creates green production parks.

4.2.4 Value Co-sharing Ecological capability

At the stage of comprehensive networking, Huawei has begun to actively share resources, help partners with digital transformation, which belongs to the proactive value co-sharing stage. Proactive value co-sharing refers to corporate behaviour that relies on the results of cooperative value

co-creation and actively shares value by helping partner companies, contributing to social construction, and protecting the ecological environment.

In 2016, Huawei helped operators to carry out digital transformation by building an industrial ecosystem. In terms of employee benefits, Huawei's annual salary continues to rise. In addition, Huawei builds out a service ecosystem by launching collaboration service series products. Huawei releases collaboration service products for its partners to help enterprises achieve digital transformation. Finally, it constitutes a green value chain by promoting the development of a circular economy in the industry and innovating green products and operation models.

4.3 Intelligent Ecological Stage (2016-present)

4.3.1 Digital Environment Perception Capability

Innovation Leadership Awareness: Huawei has proposed five major development directions for operator digitisation, opening up its platform capabilities to help operators build an open industrial ecosystem. In addition, Huawei has already begun discussions with partners on how to move into a fully intelligent world, and has put forward the GUIDE business blueprint.

Intelligent Ecology Awareness: Huawei creates a new world of connectivity through 5G technology, to turn data into a new means of production, to create an innovation platform. In the era of human society accelerating into the intelligent world, Huawei will bring together the wisdom of all people to jointly create solutions for the industry to enter the intelligent world, maintain the security and reliability of the digital world, and accelerate intelligent upgrading.

4.3.2 Digital Resource Orchestration Capability

In order to help the construction of digital China, Huawei has proposed a " city-cloud " .In 2022, Huawei will create more than 100 scenario solutions, and the release of the Cloud Pangu Weather Model 3.0 marks the beginning of Huawei's in-depth financial, government, medical and other industries to help the construction of digital China.

Huawei released the "platform + ecology" strategy to build an ICT infrastructure platform, and through the construction of an ecosystem to help customers achieve digital transformation. At the same time, Huawei establishes resource sharing channels, creates an enterprise application convergence platform. Huawei is committed to fulfilling its social responsibilities in addition to its success, joining the ITU Partner2Connect Digital Alliance and establishing an eco-partners' university to enhance the comprehensive capabilities of partners, while also cultivating ICT talents for Huawei's development to cultivate ICT talents.

4.3.3 Resource Advantage Co-Creation Capability

Leading innovation collaboration. In the intelligent ecological stage, Huawei integrates into global academic organisations to jointly cultivate industrial talents; Huawei continues to contribute its capabilities to global standards organisations, and promotes the industry's technological upgrading while promoting the industry's green digital transformation; and Huawei actively cooperates with industrial organisations such as the GCC and the UWA. Huawei upholds the concept of open, collaborative, and altruistic cooperation, and works with ecological partners and developers to create value.

Multifaceted value creation :Huawei cooperates with all parties in the industrial chain, pays attention to the physical and mental health of employees, pays attention to the social environment of the global supply chain, and cooperates with customers and suppliers. Huawei continues to lead the industry development and carry out technological innovation through resource empowerment ;

through open cooperation with industrial organizations and ecological partners in government, academic and other fields. Finally, Huawei and its ecological partners empower environmental protection and jointly create environmental value.

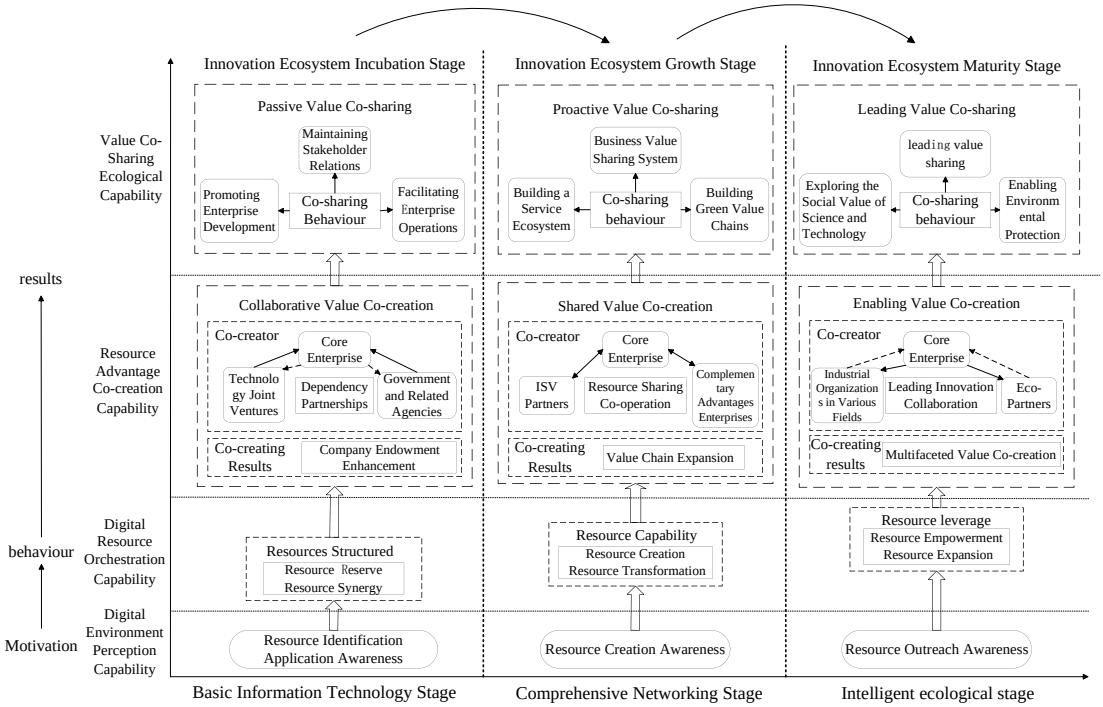
4.3.4 Value Co-sharing Ecological Capability

In the intelligent ecology stage, Huawei proactively assumes social responsibility and leads the industry in intelligent development, belonging to the leading value-sharing stage.Leading value sharing means that the core enterprise is in a leading position in the process, leading ecological partners and the entire industry into the intelligent world through resource empowerment, and at the same time undertaking social responsibility together with related entities.

Huawei has achieved industry technology leadership at this stage. While leading in technology, Huawei also opens its HMS to share its innovation ecosystem, builds a public cloud platform. Huawei's Tech4all initiative is a long-term initiative to work with partners to continue to promote technological innovation. At the same time, Huawei empowers talent development by providing a development platform for women in science and technology; establishing the Huawei Eco-Partner University to cultivate high-quality industrial talents. Finally, it implements energy-saving and emission reduction strategies and green supply ecology in environmental protection.

5. Research findings

Enterprises build enterprise digital innovation ecosystems through the dynamic capabilities of "digital environment perception capability, digital resource orchestration capability, resource advantage co-creation capability and value co-sharing ecological capability". As shown in Figure 3.



Source: Authors own work

Fig. 3 Evolutionary process of value co-creation and co-sharing in digital innovation ecosystems

At the stage of digital transformation basic informatization, enterprises use dynamic capabilities to form a cooperative innovation ecosystem through "resource identification and application awareness - resource structured - cooperative value co-creation - passive value co-sharing", that is ,the stage of

innovation ecosystem incubation. At the stage of digital transformation comprehensive networking, the enterprise forms a resource-sharing innovation ecosystem through "resource creation awareness - resource capability - shared value co-creation - proactive value co-sharing" with the help of dynamic capabilities, that is ,the stage of innovation ecosystem growth. At the stage of digital transformation intelligent ecology, the enterprise has formed a resource-enabling innovation ecosystem through "resource outreach awareness - resource leveraging - enabling value co-creation - leading value co-sharing", that is ,the mature stage of innovation ecosystem.

Enterprises have different digital innovation ecosystem models at different stages of digital transformation.Based on the dynamic capabilities mentioned above, the enterprise innovation ecosystem is also evolving according to the division of the enterprise digital transformation stage, which is mainly divided into the innovation ecosystem incubation stage, the innovation ecosystem growth stage, and the innovation ecosystem maturity stage.

References

[1] Tansley A G. The use and abuse of vegetational concepts and terms[J]. Ecology, 1935, 16(3): 284-307.

[2] Moore J F. Predators and prey: a new ecology of competition[J]. Harvard business review, 1993, 71(3): 75-86.

[3] Ander . Match your innovation strategy to your innovation ecosystem[J].Harvard Business Review,2006,84 (4):98-107,148

[4] Xie X, Mu X, Tao N, et al. The coupling mechanism of the digital innovation ecosystem and value co-creation[J]. Advances in Environmental and Engineering Research, 2023, 4(1): 1-9.

[5] Nambisan S . Architecture vs. ecosystem perspectives: Reflections on digital innovation [J]. Information and Organization, 2018, 28 (2): 104-106.

[6] Beltagui A ,Rosli A ,Candi M . Exaptation in a digital innovation ecosystem: The disruptive impacts of 3D printing [J]. Research Policy, 2020, 49 (1): 103833.

[7] Li M, Liu Y. The influence of digital innovation ecosystem of high-end equipment manufacturing on the intelligent maturity of enterprise–an empirical study on the configuration of the "three-layer core-periphery" structure[J]. Business Process Management Journal, 2024, 30(1): 199-221.

[8] Ji H, Zou H, Liu B. Research on dynamic optimization and coordination strategy of value co-creation in digital innovation ecosystems[J]. Sustainability, 2023, 15(9): 7616.

[9] Men F, Dong F, Liu Y, et al. Research on the impact of digital transformation on the product R&D performance of automobile enterprises from the perspective of the innovation ecosystem[J]. Sustainability, 2023, 15(7): 6265.

[10] Yang G. Knowledge Element Relationship and Value Co-Creation in the Innovation Ecosystem[J]. Sustainability, 2024, 16(10): 4273.

[11] L. S V ,F. R L . Evolving to a New Dominant Logic for Marketing [J]. Journal of Marketing, 2004, 68 (1): 1-17.

[12] Chen Y, Chen Y, Guo Y, et al. Research on the coordination mechanism of value cocreation of innovation ecosystems: Evidence from a chinese artificial intelligence enterprise[J]. Complexity, 2021, 2021(1): 7629168.

[13] Li Y, Fu K, Gong X, et al. Research on value co-creation mechanism of platform enterprises in digital innovation ecosystem: A case study on Haier HOPE platform in China[J]. Frontiers in Psychology, 2022, 13: 1055932.

[14] WU Lidong, LI Sijia, WANG Han,et al. Research on digital transformation progression mechanism of manufa cturing enterprises based on "corporate governance-organizational capability" configuration model [J/OL]. Nank ai Business Review, (in China)1-27[2024-11-04]. http://kns.cnki.net/kcms/detail/12.1288.F.20230911.1916.004.html.