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Research on the Construction of Digital Capability of Manufacturing Enterprises under the Background of Digital Transformation

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Abstract

Under the background of digital transformation, it is urgent for enterprises to realize the digital transformation of manufacturing enterprises, and the key to smooth transformation lies in the construction of new digital capabilities. Enterprises change from the pursuit of single value creation to multiple subjects to create value. How to obtain and use internal and external resources to build digital capabilities of value co-creation-oriented manufacturing enterprises, and realize transformation and upgrading and sustainable development is a key issue of great research value. This paper adopts the inductive and exploratory single case study method, and selects Shenhui Printing Company as the research object. The study shows that enterprises should pay more attention to the construction of digital capability to promote digital transformation and follow the correct development path; enterprises should adhere to the value co-creation orientation, actively identify and connect business partners to build a benign ecosystem, innovate value creation logic and establish continuous competitive advantage; enterprises should clarify the key role of resource orchestration in the construction of digital capability, and adopt appropriate resource orchestration means at different stages to form the internal motivation for sustainable development. This paper provides practical guidance for manufacturing enterprises to construct digital capabilities to obtain competitive advantages in the context of digital transformation.

Keywords

Value Co-creation; Resource Orchestration; Digital Capability; Case Study.

1. Introduction

With the development of big data, cloud computing and artificial intelligence, digital technology has been widely penetrated into human production and life, and digital economy has become an important engine driving high-quality economic development (Singhal et al., 2018)[1]. China's "14th Five-Year" Digital Economy Development Plan " clearly proposes to promote the deep integration of digital technology and the real economy, enable the transformation and upgrading of traditional industries, and promote the construction of a digital China. Under the background of digital transformation, the rapid rise of big data, cloud computing and other digital technologies and widely used in enterprise production, sales, service and many other links, fundamentally changed the essence of enterprise competition [2], enterprises began to change from the pursuit of single value creation to multiple subjects to create value. To this end,

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enterprises should not only integrate and give play to the new functions of digital technology to build digital capabilities, but also have insight into the interaction mode and operation mode change between enterprises, customers, suppliers and other stakeholders, and dynamically adjust to gain advantage [3]. For example, Qingdao Hongling Group and other enterprises use digital technology and digital resources, through effective management and allocation, cultivate digital capabilities, innovate the interactive mode of multiple subjects, to achieve the successful transformation of digital enterprises [4]. Thus, the construction of digital capability has become an inevitable trend of the transformation and development of manufacturing enterprises.

Under the background of digital transformation, the construction of digital capability of traditional manufacturing enterprises has become the key [1] to acquire new competitive advantages. By combing the relevant literature at home and abroad, it is found that in recent years, scholars have defined the concept of digital capability from the perspectives of capability, strategy and value. For the type of digital ability, the existing research proposes three dynamic capabilities built by traditional enterprises to adapt to the development of digital economy: digital perception ability, digital capture ability and digital transformation ability, and the digital ability of manufacturing enterprises includes three basic elements: intelligent ability, analysis ability and connection ability. As for the impact of digital capability, scholars propose that digital capability is the basis for enterprises to transform their operation process, reconstruct their business model and improve customer experience, which can effectively promote the process of digital transformation and establish differentiated competitive advantage [4-5]. However, there is still a lack of inquiry into how manufacturing companies can build their digital capabilities. Is digital capability an extension of traditional capability, or a reconstruction of digital resources? Is it an overnight development, or a gradual formation? The above questions need to be explored. For value co-creation research, the existing research gradually focuses on value co-creation between enterprises and customers, but there is still a relative lack of value co-creation research from the perspective of interaction between enterprises and other stakeholders and ecosystems, and there is no in-depth analysis of the value co-creation research of multi-subject collaborative interaction of manufacturing enterprises. Therefore, under the guidance of value co-creation, how to form and develop the digital ability needs to be deeply explored. The digital capacity of manufacturing enterprises is highly related to the coordination and allocation of internal and external resources. Resource orchestration theory is from the development of resource base, in the process of resource orchestration, resource structured, resource ability-resource leverage presented from the structure of resource combination, to bind resources to build ability, to rely on ability coupling subject release value of dynamic process, resource orchestration theory is suitable for explaining the process of building mechanism and dynamic evolution of [6].

Based on the above realistic problems and insufficient research, this research is based on the theory of resources arrangement, selection of Bengbu ShenHui color printing and packaging co., LTD. (hereinafter referred to as "ShenHui printing") as the case study object, trying to explore and answer the following core questions: under the value to create guidance, manufacturing enterprises how to use resources to build digital capabilities? This research through the analytical value to create oriented manufacturing enterprises in the process of digital development, through different resources arrangement means to build the process of digital ability mechanism, rich digital ability of related research, expand the application of resource orchestration theory situation, and for manufacturing enterprises to build digital ability to enhance the competitive advantage of digital transformation practice provide reference and guidance.

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2. Literature Review

2.1. Value Co-creation

Value co-creation refers to the dynamic process[7], in which enterprises, customers, suppliers and other value subjects cooperate to create value through resource integration and service exchange. Value co-creation research has gradually become a hot topic of research. The existing research not only focuses on the dual interactive value co-creation between enterprises and customers, but also focuses on the multi-dimensional interactive value co-creation between enterprises and multiple stakeholders. At the micro level of binary interaction, based on the case study of customer participation in value co-creation in the Internet era, Zhang et al. (2017) proved that customer participation plays a significant role in promoting brand value co-creation, and summarized five mechanisms for customer participation in brand value co-creation[8].Zeng Lian et al.(2017) explored the interaction between the environment, enterprises and customers in the service ecosystem to create value, which is of reference significance for the transformation and upgrading of Chinese manufacturing enterprises under the Internet context [9]. In the macro layer of multiple interaction, Ramaswamy and Chopra (2014) proposed that the means of modern enterprise value co-creation transformation include building a platform and attracting stakeholders to participate, so as to promote the co-creation of value[10] among multiple subjects.

2.2. Resource Orchestration Theory

The theory of resource orchestration is developed from the concept of resource basis. Sirmon et al. (2007) integrated the research results related to resource management and asset arrangement,[7]. Resources are a necessary condition to obtain competitive advantage, effectively arranging and manage resources to promote the transformation of [7] between resource, capacity and value. Resource orchestration theory focuses on the active role of managers to use resources to build capacity and create value. Sirmon et al. (2007) divided the resource orchestration into three sub-processes, namely, resource structure, resource capacity, and resource leverage [7]. Among them, resource structure means that managers acquire and accumulate key resources and remove invalid resources; resource capability is to transform resource combination into core capabilities, and managers expand the existing capabilities in the existing resource combination; and resource leverage is connecting [7] to release resource value by mobilizing, coordinating and deploying different resource combinations. From the construction of resource combination, to the shaping ability of binding resources, and then to the creation of value by relying on the ability, the theory of resource orchestration interprets the complete process of resource source, transformation and utilization [7]. The current research mainly focuses on process innovation,social innovation,digital innovation, frugal innovation,business model innovation[29], etc. In terms of improving performance, scholars explored their influence and role on financial performance [11],operational performance and innovation performance based on the theory of resource orchestration. For building capabilities, the formation of capabilities is originally embedded in the resource orchestration process. Under the background of digital transformation, although new digital resources have been brought to enterprises, only having resources is not enough to form capabilities. Enterprises must manage and arrange resources to create value and gain competitive advantage [7]. Digital development requires enterprises to carry out their resource scheduling process [12] from a systematic and value-creation-centered perspective. In order to adapt to the digital trend, enterprises must use digital resources and cultivate digital capabilities [13].Zhang Na et al. (2021) proposed to arrange resources through external acquisition of digital resources, digital capability expansion and digital value creation, and partially realized

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the [14] of organizational agility. Throughout existing research, how digital capabilities are generated or constructed by resource choreography is not clear.

2.3. Digital Ability

In the context of digital transformation, more and more scholars pay attention to digitalization and its related capabilities, which is regarded as the main source for enterprises to obtain sustainable competitiveness[1]. Digital capability is the basis for enterprises to improve customer experience, transform operational processes and reconstruct business models. It can effectively promote the digital transformation process and establish differentiated competitive advantage [5-6]. In recent years, scholars have defined the meaning of digital capability from multiple perspectives of capability, strategy and value. According to the dynamic theory of capability, researchers believe that digital capability is the dynamic ability of organizations to develop new products and new processes, and to respond to the constantly changing external environment [15]. In the context of digital products, digital ability is the skill and knowledge [16] of enterprises to manage the development of new products. This paper agrees with Annarelli et al. (2021), defining digital capability as an organizational capability [1] that extensively combines digital assets and business resources, utilizes digital networks, innovates products, services and processes to promote organizational learning and value creation, and gains continuous competitive advantage through management innovation. The existing digital capability research mainly focuses on the concept definition, type division and influence effect. Digital capability is the premise for enterprises to realize digitalization. Data, licensing and analysis capabilities comprehensively show the digital capability level of enterprises [17]. For the type of digital capability, scholars analyze the qualitative data of manufacturing enterprises, and summarize the digital capability into the three basic elements of intelligence ability, analysis ability and connection ability [16]. In the Internet-based business incubation platform, scholars divide the digital ability into three dimensions, namely, the digital operation ability, the digital organization ability and the digital co-creation ability of [28]. Warner And Wager (2019) explore the three dynamic capabilities built by traditional enterprises to adapt to the development of the digital economy, namely, digital perception capability, digital capture capability and digital transformation capability [20]. The shaping of digital capability requires the collaborative interaction of enterprises, customers, suppliers and other stakeholders, and the construction of digital capability breaks through the organizational boundary [6]. More and more manufacturing enterprises attach importance to and use digital capabilities to realize their development strategy [25]. Digital capabilities bring opportunities for enterprises to achieve higher reliability and higher efficiency, and enhance the value created by manufacturing enterprises for customers.

3. Research Design

3.1. Research Method

This study is theoretically constructed using an inductive, exploratory single-case study method, The reasons are as follows: First, This study aims to answer the value co-creation-oriented manufacturing enterprises in the digital development, How to build digital capabilities through resource choreography, By analyzing the description of dynamic processes, Suitable for the use of case study methods to analyze the essential characteristics of complex phenomena [22]; second, For the manufacturing companies, Digital capabilities are often the result of gradual formation and dynamic evolution, Its construction process is in the constant exploration and development, Exploratory case study methods have advantages in exploring mechanism construction, Aable to follow chronological logical inferences of critical events, Show the dynamic and gradual changes of different stages [18]; third, Case studies help to get

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inspiration from phenomena and generate new insights and propose new propositions, Promote the understanding of new phenomena in practice.

3.2. Case Selection

This paper selects the manufacturing enterprise applying for emblem printing as the case object, mainly for the following reasons: (1) industry representativeness. Manufacturing enterprises are the foundation of the country and the cornerstone of prosperity. Shenhui Printing Co., Ltd. (hereinafter referred to as "Shenhui Printing") was founded in 2003. Manufacturing enterprises mainly relying on cost, scale and industrial supporting facilities choose digital transformation in the tide of digitalization, which is representative.(2) The picality of transformation. According to the change of the digital environment, actively carry out the digital transformation. In the process of digital transformation, the use of digital technology is not limited to the enterprise itself, and through continuous attempts and changes, it has become a typical enterprise in manufacturing enterprises.(3) Data richness. Information and information is more open, first-hand and second-hand information is rich. Its digital transformation has experienced a complete life cycle, from the beginning to the basic completion is more detailed, the available information is relatively complete, in line with the case needs of this paper.

3.3. Data Collection

The main acquisition methods of the primary information in this paper are mainly semi-structured interviews, informal interviews and field trips. Discuss the data repeatedly according to the principle of triangle argument. The primary data source for this study is the semi-structured in-depth interviews. Since 2021, the case enterprises have been continuously tracked, and four field investigations and in-depth interviews were conducted from September 2021 to June 2023. The average interview time was 2-3 hours. The whole process of the interview was recorded and the interview process was recorded in detail. The interview objects involved the chairman of the board, general manager, branch manager, branch manager, department director, product manager, research and development personnel, sales personnel, production personnel, transportation workers, etc., and the total interview data reached more than 603,000 words.

3.4. Data Code

This study follows the principles of data coding and analysis in the case study to construct the theory. The coding process is divided into four stages [23]: initial coding, focused coding, axis coding and theoretical coding. The whole coding process is repeated and iterated.

Initial coding stage: through the initial coding of the data collected in the early stage, a clear and orderly data coding table is obtained. Initial coding requires open theoretical exploration as close as possible to the original data, forming a rich topic of digital capability construction. Focus coding stage: on the basis of initial coding, further selection and reduction of interview data, focusing on back-to-back independent coding of research questions. The data were classified with key constructs by focusing coding and the relevant theoretical genera were summarized.

Axial coding stage: Based on the focused coding results, the attributes and dimensions of the theoretical genera are embodied, so that the scattered data analysis results are connected. Construct the correlation between classes, excavate the deep connotation of focused coding, abstract the key constructs into the theme [24] with more theoretical connotation, and fully prepare for the theoretical coding Theoretical coding stage: theoretical coding is used to construct the theoretical logic between the main categories and genera, and to form an interrelated and smooth logical theoretical framework. Through the original data, coding results and repeated contrast between literature theory, form a preliminary theoretical framework, on the basis of continuous inductive refining, repeated iteration, and using multiple

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data sources and verification, gradually realize data and theoretical matching and guarantee from the data analysis to the theory of logic clear and reasonable, and improve the theoretical framework of the interpretation of practical phenomenon. Tables 3 – 3 are coded key constructs, variable measures, and keywords presented in encoding. Value co-creation orientation: Value co-creation refers to the dynamic process [18,] in which enterprises, customers, suppliers and other value subjects cooperate to create value through resource integration and service exchange. Value co-creation orientation is that the enterprise will interact and cooperate with stakeholders to create value as the direction of [8]. Single-point of value creation orientation refers to that the enterprise is a single value subject, By mobilizing their own abilities, As a single provider to meet customer needs to create value; Chain value creation orientation means that the enterprise, as the ability integrator connecting different value subjects, Through top-down, multiple interactions, Mobilize their own ability combination, Match the customers' consumer needs to create value; Value creation network orientation is enterprise-centered, Collaborative and multi-line interaction with multi-value subjects, Participate in value creation activities together, Create value together in the process of multi-line development; Value co-creation of ecological orientation refers to enterprises connecting more stakeholders, Committed to building a benign ecosystem, Mutual benefit and symbiotic coexistence among value subjects, Create the shared value in the multi-center ecological development Resource orchestration: The key to resource orchestration theory is that managers use resources to build capacity and create value. Sirmon et al. (2007) divides resource orchestration into three sub-processes, namely, resource structure, resource capacity and resource leverage [7]. Among them, the goal of resource structure is to build resource combination, including acquisition, accumulation and stripping. Managers acquire, accumulate key resources, and divest invalid capital.

4. Case Analysis

This study selected research period since 2005, the reason is: in 2005, the printing industry began to focus on digital construction, then opened the digital development, on the one hand, introducing advanced digital printing equipment from abroad, on the one hand, the development of digital process management system, etc., with the help of digital resources, from the formation of digital production capacity as a starting point, gradually build up the digital ability of ecological printing industry. At the same time, the orientation of value co-creation also gradually develops from the single value creation of the enterprise to the coordination of all parties to create value. Therefore, this study draws on the research results [24] of Zhou Jian et al. (2020) [24], and divides its digital development process into four stages according to the evolution of digital ability of printing and value co-creation(as shown in Figure1).

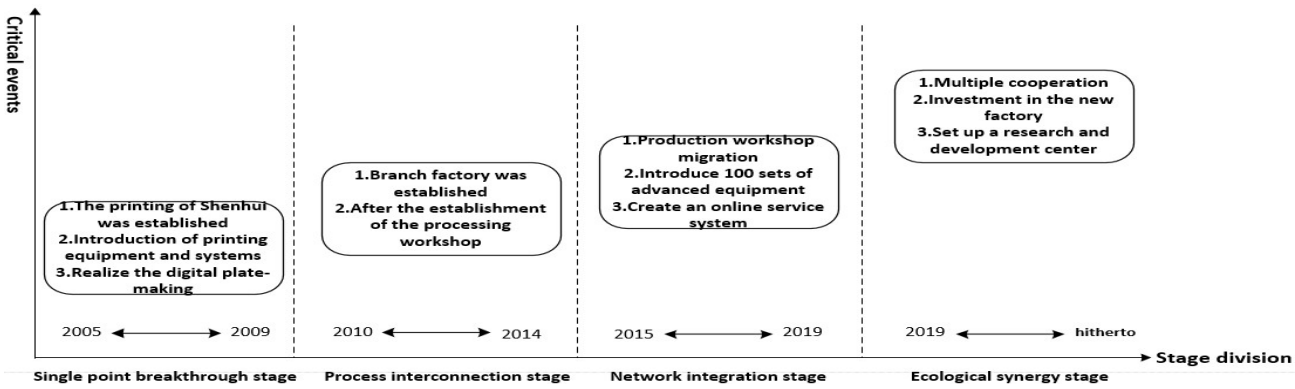

Figure 1. Key events and stage division of emblem printing

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4.1. Single Point Breakthrough Stage(2005-2009)

In 2005, with the rapid rise and wide application of computer technology and network technology, digital printing characterized by on-demand printing has a good development momentum and an increasing market share. Driven by advanced technology, the printing industry has ushered in new opportunities and challenges, and digital printing has gradually taken root and flourished in China. With the needs of the market and the expansion of the business, many printing enterprises began to pay attention to the digital transformation, follow the development trend of the industry, have a large investment in digital printing equipment, additional distribution stores and direct stores in the local market or economically developed areas. At the beginning of its establishment, ShenHui printing will print business cards as the main business, the new adhesive business. At this stage, Shenhui printing, as a single subject, provides customers with products and services, but the product types are limited, which can only meet the printing needs of some customers, and enterprises can realize value creation.

Resource structure-acquisition: Enterprises obtain new resources from external markets through purchase, exchange and other ways to build resource combinations [7]. In the early stage of digital construction, the dominant resource orchestration means is that compared with the internal resource development, it is more economical to obtain new resources from the external factor market, can grasp the development opportunities, and save the time and cost of obtaining resources to the greatest extent. ShenHui printing after founded in Bengbu 2003, to meet the rapidly growing market demand, gradually buy Hamada four color machine, Heidelberg plate machine direct digital printing equipment, the introduction of laser photo system, printing process management system, printing quality and efficiency greatly, at this stage, ShenHui printing through the way of acquisition, built with location resources, equipment resources and technical resources of digital resources combination.

Resource capacity-richness: Enterprises extract key resources from existing resource combinations and shape new capabilities [7] by bundling complementary resource bundles. The key to capacity is to transform resources into capabilities and use the combination of resources to form capacity [19]. Shenhui printing takes the production link as the starting point of the construction of digital capacity, integrates superior resources in the production link, and uses the digital resource combination of equipment resources and technical resources to establish an advanced digital production line, improve the printing efficiency and production flexibility, realize all digital plate making, and form the digital production capacity.

Resource leverage-mobilization: the enterprise mobilizes its own ability to meet the needs of different customers to create value [7]. Leverage focuses on the matching between enterprise capabilities and customer needs, and uses the matching combination of capabilities to create value [26]. At this stage, equipment suppliers and direct customers are identified as the center, but equipment suppliers do not directly participate in the process of value creation and value transmission, but constitute [21] as the subsidiary structure and capability of the enterprise, helping enterprises to form digital production capacity by providing complementary resources. As a single value subject, THE digital production capacity is used to fully meet the needs of customers and create transaction value by interacting with direct customers. In conclusion, ShenHui printing guided by single point of value creation, namely a single enterprise as the main body to create value, by obtaining-rich-mobilize resources arrangement, the advantage digital resources focused on production department, through effective arrangement formed the digital production capacity, in the production capacity, create trading value.

Proposition 1: In the single point breakthrough stage, manufacturing enterprises are oriented by single point value creation, and tend to adopt the resource orchestration means of acquisition-enrichment-mobilization combination to shape the digital capability point.

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4.2. Process Interconnection Phase (2010-2014)

In 2010, the digital printing technology in the Chinese market was continuously upgraded, and the impact of production digital printing equipment on printing enterprises was more significant. Many digital printing enterprises break in innovation in their respective application fields, formed their own characteristics, at the same time use digital printing equipment to achieve process innovation and enterprise transformation. The digital development in the early stage of Shenhui printing is progressing smoothly, found a profit model suitable for the enterprise, and more determined the digital construction of the enterprise. With the expansion of demand scale and the increase of market share, Shenhui printing has successively set up branch factories. Under these conditions, Shenhui printing is committed to changing the original backward business process, through the introduction and application of advanced digital equipment, digital technology and digital system, innovative business development model, based on the main business to build digital capabilities, to avoid the formation of "digital capability island". At this stage, Shenhui Printing gradually built cross-department and cross-business diversified digital capabilities, expanded product categories, and gradually became indirect customers such as advertising stores, graphic stores and printing stores, and the enterprise profits increased year by year.

Resource structure-acquisition: The emblem printing insists on the acquisition-led way to obtain new resources from the external market, and shape a reasonable structure of resource combination []. In order to meet the rapidly growing market demand, it continues to introduce the latest digital printing equipment; on the other hand, it continues to expand the enterprise scale, expand the business scope, and establish the digital printing operation center. The newly established post-processing workshop, the introduction of glue nail, film mulching and other post-process equipment resources, so as to maximize the productivity and production efficiency. Through the leading resource orchestration means, the digital resource combination of equipment resources and overall resources is constructed.

Resource capacity- development: Enterprises bind new resources obtained by external markets with existing resources, and integrate old and new resources through new ways to create new capabilities[25]. With the help of strong merger and innovative operation management, Shenhui Printing integrates the advantageous location resources of both sides to establish the digital operation center, comprehensively manages the overall digital operation process of the enterprise, promotes the digital product innovation, and gradually forms the digital operation and management ability. At the same time, on the basis of the original location resources and equipment resources, Shenhui Printing continues to introduce new equipment, establish digital production centers in many places through resource integration, create digital production mode, and further enhance the digital production and operation capacity.

Resource leverage-mobilization: As the ability integrator connecting different value subjects, enterprises create value by matching the consumer needs of different customers to mobilize their own ability combination.At this stage, the value subjects identified by enterprises mainly include merged enterprises, equipment suppliers and indirect customers. Through the interaction with different value subjects, enterprises acquire complementary resources and build capacity combinations. Hui printing is the main value subject, and the participation of other value subjects has significantly increased. Based on the overall command of digital operation and management ability, using digital product innovation ability to develop new products and new services, targeting indirect customers such as advertising stores and graphic stores, giving full play to digital production and operation ability, and creating transaction value through multi-point interaction. In conclusion, ShenHui printing to chain value creation as the guidance, namely the enterprise and the related value subject more interaction to create value, by acquiring-development, based on the main business to form the operation management, production, product innovation of digital chain, the core process of digital ability, using digital

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technology to strengthen product research and development design, in the main activities of operation and management data and integrated operation, on the basis of realizing the enterprise flexible operation management and intelligent auxiliary decision-making, in the interaction with indirect customers more create trading value.

Proposition 2: In the stage of process interconnection, manufacturing enterprises take the chain value creation as the guidance, and tend to adopt the resource orchestration means of acquisition, development and mobilization combination to shape the digital capability chain

4.3. Network Integration Phase (2015-2018)

In 2015, China's economy entered a "new normal", encouraging deep adjustment, transformation and upgrading, and China's digital printing market is booming. In 2015, Shenghui printing has gradually entered the fast lane of digital development, realizing the digitalization of the main business process, but Shenghui printing has also exposed a series of problems. Therefore, the main goal of the printing at this stage is to adjust in time for the problem, cooperate with multiple participants to interact and cooperate, create supporting services, and build specific digital capabilities in each link based on the overall development of the enterprise. Shenhui printing continues to introduce advanced equipment, increase the printing business, increase 12 categories of product categories, including PVC fans and posters, upgrade and optimize the samples of each category, and create original comprehensive samples of all categories. At this stage, Through multi-party cooperation, Shenhui Printing integrates the enterprise's research and development, operation, production, sales, service, distribution and other related links, forming a digital comprehensive capability, and building a digital capability network covering the whole enterprise. Digital development has greatly improved the company's profits, attracted and expanded the service scope and customer scale, and created multiple values in indirect customer interactions across the country.

Resource structure-acquisition: At this stage, Shenghui printing mainly obtains new resources through multiple channels, and constructs a digital resource combination suitable for the development of enterprises. Aiming at the advantageous location resources to realize digital centralized production; establishing digital printing base with the government support of the printing system, introducing digital printing press, professional binding machine, automatic transmission and sorting belt, color scanning system and other equipment resources. The printing absorbs professional technical talents from the outside and establishes technical team and design team to make up for the shortage of digital talents. It can be seen that a digital resource combination of location resources, human resources, logistics resources and data resources.

Resource capacity-development: Shenhui printing mainly bundles new resources and existing resources of enterprises in a new way to realize the transformation from resource combination to capacity combination. First of all, based on the existing resources of the enterprise, Shenhui printing combines the new location resources, equipment resources and overall resources, comprehensively expands the scale of digital production, and improves the original digital operation management and production capacity. Secondly, for the logistics distribution department, Shenhui printing uses big data to connect logistics, innovates the distribution process, monitors the road conditions in real time and adjusts the line, and gradually forms the digital transportation distribution and response service capabilities. Finally, Shenhui Printing combines external introduction with internal training, vigorously absorbs and cultivates professional talents, sets up a technical team and design team, and cooperates with the latest technology and equipment resources of the enterprise.

Resource leverage-coordination: enterprises coordinate the ability of different value subjects to play play, participate in value creation activities together, and create value [7] by meeting the different needs of customers. At this stage, the value subjects identified by enterprises

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mainly include suppliers, government, merged enterprises, customers and fans, e-commerce operators, logistics companies, etc. These value subjects directly transfer or share resources to enterprises with the goal of value co-creation. Guided by network-based value creation, multi-line interaction is committed to expanding the scale, expanding the market and research and developing products. Through interaction with the government, obtain the support of government funds, policies and other resources, establish production base, realize scale expansion; conduct cooperative resource allocation with logistics companies and e-commerce operators, give play to their respective advantages to create transaction value, information value and strategic value.

Proposition 3: In the stage of network integration, manufacturing enterprises are guided by nework-based value creation and tend to adopt the combination to shape the digital capability network.

4.4. Ecological Synergy Phase (2019-Present)

In 2019, the changeable internal and external environment also prompted the printing industry to accelerate the pace of transformation and upgrading, structural optimization, and continuous innovation, and promote high-standard and deep industry reform. In this situation, the digital trend of printing industry requires interests of enterprises to work together, common development, in 2019, ShenHui printing basic building covering the whole enterprise digital ability network, this stage with the value of ecological synergy create oriented, identify and connect more stakeholders, committed to construct a benign ecosystem, ShenHui printing actively improve and improve their comprehensive ability, with the help of digital resources promote intelligent level. At the same time, the emblem of printing will be its own capabilities to empower the ecosystem. This stage is guided by the ecology-based value co-creation, that is, the printing actively identifies and connects more stakeholders, is committed to the construction of a benign ecosystem, mutual benefit and symbiotic coexistence among value subjects, shaping digital ability ecology through mutual empowerment, and creating and shared value in the multi-center ecological development.

Resource structure-accumulation: enterprises accumulate resources in the way of internal development and cultivation to build resource combination [7,27]. Because the external factor market cannot provide all the resources needed for the development of the enterprise, and the enterprise has a strong digital comprehensive ability, the printing adopts the dominant resource orchestration means. Shenhui Printing adheres to the digital talent cultivation, establishes strategic cooperation with equipment suppliers, and deepens the win-win cooperation with e-commerce operators. By means of accumulation, Shenhui printing has constructed a digital resource combination based on technical resources, data resources, human resources and knowledge resources.

Resource capability-stability: enterprises use the existing resource portfolio to supplement and improve the existing capabilities to enhance the capacity portfolio [7,27]. At this stage, Shenghui printing on the one hand, through the new development of technical resources, equipment resources and overall resources, to scale, standardization, intelligent development as the main line, the digital operation management and production capacity to reach the top level. With the effective combination of logistics resources and technical resources, efficient distribution and service quality are improved, and the digital transportation distribution and response service capability are strengthened. On the other hand, through the integration of resources to supplement the existing ability combination, Shenghui Printing will focus on the cultivation of digital talents, vigorously develop professional and technical talents, guide stakeholders to actively participate in the ecosystem, use its own digital ability to empower the ecosystem, and cultivate the digital ecological co-construction ability.

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Resource leverage-deployment: enterprises deploy the ability combination of different value subjects, establish the supply-demand relationship chain between the value subjects, and realize the value co-creation [7,22] by meeting the different needs of different subjects. At this stage, enterprises should identify and guide more value subjects to participate in the ecosystem. The goal of Shenhui Printing is to create a first-class intelligent printing industry ecology, integrate the advantages of all parties to jointly build a resource pool, to meet the market demand and help multiple benefits as the fundamental purpose, integrate into the ecology and empower the ecology, and gain incremental value in the ecological synergy. Shenghui Printing connects manufacturers and suppliers to establish strategic cooperation, based on technology sharing, resource optimization and value co-creation mechanism, and is committed to product research and development and business innovation to create value. At the same time, Shanda Printing is good at using digital technology and digital media to establish extensive contact and continuous interaction with customers, and actively guides customers to participate in value co-creation and create new customer value.

Proposition 4: In the stage of ecological coordination, manufacturing enterprises are oriented based on ecological value co-creation, and tend to adopt the resource orchestration means of accumulation, stability and deployment combination to create the digital capability ecology.

5. Conclusion

Based on the theory of resource orchestration, through the longitudinal case analysis of Shenhui printing, the theoretical model of the digital capability construction of manufacturing enterprises is summarized (as shown in Figure 2). The main research conclusions of this paper are as follows: first, manufacturing enterprises use different resource orchestration means to gradually build digital capability; second, digital capability construction is a process of gradual formation and continuous enrichment; third, value co-creation orientation has an obvious guiding role in the construction of digital capability.

Manufacturing enterprises use different resource orchestration means to gradually build digital.capabilities Manufacturing enterprises gradually build digital capabilities by using "structure-capability-leverage", and there are different resource orchestration strategies adopted by enterprises at different stages. Through the longitudinal analysis of the printing, this research divides the construction process of digital capability into four stages: single point breakthrough, process interconnection, network integration and ecological collaboration. Enterprises adopt different resource orchestration methods in different stages according to the actual development to build the digital capability of each stage. In the early stage of digital development, the structure of acquired resources is adopted to save the time and cost of resource acquisition to the greatest extent, and to shape the digital production capacity to meet customer demand and create transaction value. In the later stage of digital development, the enterprise has strong digital comprehensive ability and can develop and construct a reasonable and effective resource combination according to the actual development. Therefore, develop and accumulate digital resources from inside, improve and supplement the digital capability combination through stable resource capacity, build the digital capability ecology, and use the deployed resource leverage to connect the value subject, so as to create and share value with all parties in the multi-center ecological development.

The construction of digital capabilities is a process of gradual formation and continuous enrichment.The digital capability of manufacturing enterprises has been gradually formed and continuously enriched, and different key elements constitute the digital capability with obvious stage characteristics. In the single point breakthrough stage, manufacturing enterprises take the production link as the starting point of the digital capacity construction, focus on the key breakthroughs in the production department, gather the superior resources in the production

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link, shape the digital production capacity through the arrangement of resources, improve the production efficiency, and shape the digital capacity point in the production link. In the process interconnection stage, manufacturing enterprises are committed to reconstructing business processes to avoid forming "digital capability islands". The digital capabilities of the core process are connected with each other, and digital technology is used to strengthen product development and design. On the basis of integrated operation data, flexible operation management and intelligent assisted decision-making are realized. In the stage of network integration, manufacturing enterprises base on the overall development and integrate resources, and build specific digital capabilities in each department. In view of the problems in the development of digitalization, the enterprise timely adjusted, integrated research and development, operation, production, sales, service, distribution and other related links.In ecological synergy stage, improve and perfect the existing ability combination, outward output digital comprehensive ability and can assign ecosystem, realize the ecological partner data, technology and business synergy, enhance the ecological system value subject between resource sharing, intelligent exchange and interactive learning level, in the benign development of multicenter build ecological digital ability. This study reveals the digital ability to build is a from less to more, from low to high constantly enrich and improve the process, through the digital ability to digital ability chain to digital network, the digital ability ecological complete path, from the inside and outside, by the enterprise itself to the ecological extension of digital ability and assigned. Therefore, the digital capability presented in this study is a dynamic changing and constantly rich construct, which is based on digital technology, and through the integration of digital resources, it is transformed into digital production capacity, and finally forms a comprehensive innovation ability with competitive advantage.

Value co-creation orientation has an obvious guiding role in the construction of digital capability The value co-creation orientation of manufacturing enterprises has an obvious guiding role in the construction of digital capabilities, and the value co-creation gradually evolves from a single subject to the interaction of multiple subjects. In the single point breakthrough stage manufacturing enterprises,guided by single point value creation, help enterprises to build digital production capacity by providing complementary resources, and interact with direct customers to create transaction value. In the stage of process interconnection, manufacturing enterprises are guided by chain value creation, interact with multiple points from top to bottom, and build the digital capability chain with the help of the complementary resources of relevant value subjects. By mobilizing the ability combination of enterprises themselves, they match the consumer needs of different customers to create value. In the stage of network integration, manufacturing enterprises take network-based value creation as the guidance, identify and connect multiple value subjects, the enthusiasm of participants is significantly enhanced, take enterprises as the center, cooperate with multiple subjects and multi-line interaction to create supporting services. Each value subject plays its ability to participate in value creation activities and create transaction value, information value and strategic value. Ecological synergy stage, manufacturing enterprises based on the ecological value together as the guidance, actively identify and connect more stakeholders, is committed to constructing benign ecosystem, establish supply-demand relationship between value subject chain, value subject between mutual benefit, symbiotic coexistence, by meet the needs of different parties realize value, in the benign development of multicenter incremental value. This research analyzes the evolution direction of value co-creation of manufacturing enterprises, namely single point value creation-chain value creation-value creation network-value co-creation ecology. In this process, value subjects are constantly enriched, from enterprise leadership to customer participation, and then to building an ecosystem together with stakeholders on the supply side and customers on the demand side. The digital development of enterprises promotes the continuous evolution of value co-creation orientation,

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and the value co-creation orientation of collaborative interaction of multiple subjects also helps enterprises to build digital capabilities.

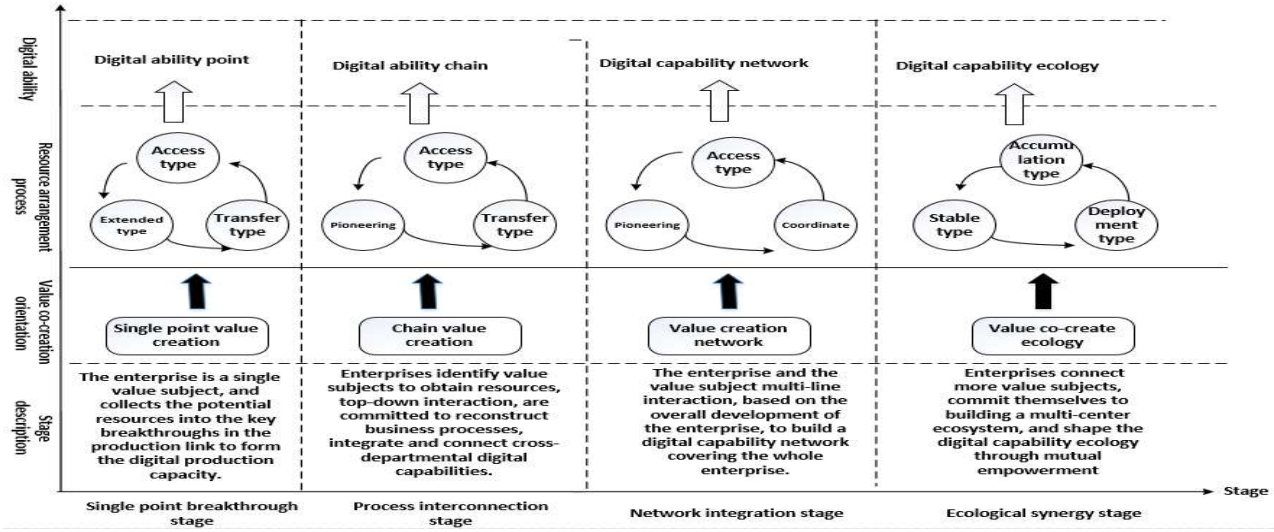

Figure 2. Theoretical model of digital capability construction of manufacturing enterprises under the guidance of value co-creation

6. Theoretical Contribution and Practical Enlightenment

This research focuses on the construction process of digital capabilities of manufacturing enterprises in the era of digital economy. The key elements of the development of digital capabilities at different stages fill the existing literature on how to construct digital capabilities are considered The research gap formed by the foot, study explores the construction process of digital capability of manufacturing enterprises from the perspective of resource arrangement, and expands the applicable situation of resource arrangement theory. This study explores the evolution characteristics of the value co-creation orientation of manufacturing enterprises under the digital situation, enriches the theoretical research of the generation value co-creation of digital economy, and provides new insights for the logic of enterprise innovation value creation, this study analyzes the interactive evolution mechanism of value co-creation orientation, resource arrangement and digital ability, which provides a new theoretical perspective for the subsequent research.

Manufacturing enterprises should attach importance to the construction of digital capabilities to promote the digital transformation of enterprises. Constructing digital capability and realizing digital transformation is the fundamental driving force for the survival and development of enterprises. Manufacturing enterprises should use the comprehensive capability of digital to cope with the external environment to promote the sustainability of digital transformation. Manufacturing enterprises should choose the value co-creation orientation suitable for their own development and establish a sustainable competitive advantage. Under the background of digital transformation, the ecosystem of collaborative interaction of multiple value subjects has become a new paradigm of value co-creation. Enterprises should adhere to the orientation of value co-creation, actively identify and connect business partners to build a multi-center benign ecosystem, create and share value in ecological development, and gain sustainable competitive advantages.

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7. Research Limitations and Perspectives

This study yielded valuable conclusions through longitudinal case studies, but still due to objective and subjective factors There are some deficiencies, in the future can continue to carry out a more comprehensive and in-depth research.The situation of enterprise digital transformation is diverse and the conditions are complex, and the research conclusion has certain external validity problems, which needs to be expanded and confirmed through large sample research in the future.Future research should focus on participation in value creation All social subjects in the creation process explore the coordination and interaction of the stakeholders involved from a more systematic and comprehensive perspective And the guidance and mechanism of value co-creation, to analyze how all participants share and exchange in the mode of the ecosystem Resources, based on the mechanism of interaction and cooperation, etc.The data collection process in the present study mainly used semi-structured in-depth interviews, and interviews may exist Although the ambiguity of object memory leads to inaccurate information has been cross-checked and mutually verified by multiple data, However, there may be errors to some extent. In the future, enterprises can continuously track case enterprises and update data to ensure The scientificity and effectiveness of the data.

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