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Analysis on the Mechanism of College-Enterprise Cooperation in Cultivating Supply Chain Talents

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Abstract. Objective: To discuss the mechanism of college-enterprise cooperation in cultivating supply chain talents. Method: Referring the philosophical thoughts of "Tao begets one, two begets two, two begets three, and three begets all things" in Chinese "Tao Te Ching", the value model of supply chain talent training is constructed to analyze the college-enterprise cooperation mechanism. Conclusion: Requirements for the supply chain talent training mechanism include the elaborate construction of the training base, the strategic cooperation with supply chain platform and colleges, and the promotion of linkage between supply chain talents training and employment. Suggestion: The main body of talent cultivation is to be matched and adapted from the perspective of "Tao begets one", all parties involved in college-enterprise cooperation should intend to attach great importance to the creation and service of the supply chain platform from the perspective of "one begets two" and intend to actively carry out the four-in-one supply chain talent training.

Keyword. College-enterprise cooperation; Supply chain talents; Cultivation mechanism.

1. Introduction

The college-enterprise cooperation model can significantly improve students' practical ability and employment competitiveness, but the traditional education model often has the problem of disconnecting between theory and practice when cultivating emerging talents such as supply chain talents, especially the problems of imperfect cooperation mechanism, unreasonable curriculum system, lagging construction of teaching staff, and insufficient technological innovation and integration. The relevant literature on these problems mainly focuses on the connotation of college-enterprise cooperation, the specific content and form of college-enterprise cooperation, the problems existing in college-enterprise cooperation and the cooperation path.

(1) The connotation of college-enterprise cooperation. International scholars generally consider the collaboration between higher education institutions and enterprises as a sustainable strategy for vocational talent development. The areas of collaboration include skills training, the formulation of occupational standards, faculty

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development, and curriculum design. This partnership demonstrates significant advantages in the cultivation of talent (Oviawe J. I., 2018) [1]. Fu Wei (2010) characterizes college-enterprise cooperation as a mutually beneficial process between colleges and enterprises aimed at talent cultivation with human resources as the link. material resources as the means, and technical services as the catalyst [2]. Zhou Tong and Li Tongtong (2023) approach college-enterprise collaboration from the perspective of field theory. They argue that such cooperation is not merely an exchange; instead, it is a competition between the cultural capital of colleges and the economic capital of enterprises for advantageous positions. This competition is constructive. Colleges leverage the economic capital of enterprises to enhance their infrastructure, while enterprises secure a steady pipeline of talent through the colleges' cultural capital and research capabilities, ultimately fostering a win-win scenario for both parties [3]. Zhou Jinrong (2018), applying synergy theory, describes college-enterprise cooperation as a process in which higher vocational institutions collaborate with enterprises, industry organizations, and others to achieve common goals. This cooperation encompasses curriculum development, skills training, technical services, technological innovation, cultural heritage, and resource sharing [4]. Wang Song (2021) expands on the traditional concept of a "community of interest" in college-enterprise cooperation, elevating it to a "community of emotions." He argues that college-enterprise cooperation forms an emotional partnership rooted in shared values and positive emotions (such as mutual recognition), which drives talent cultivation and technical services [5].

(2) The specific content and form of college-enterprise cooperation. Germany's 'dual system' is one of the earliest and most mature models of university-industry collaboration, led by the German government and implemented through cooperation between schools and enterprises, with the primary goal of training students for graduation. This model involves talent cultivation in two different settings: the enterprise and the school. As Thomas Deissinger (2001) noted, one component of the dual system is vocational schools, where teachers are responsible for delivering theoretical knowledge. The other component is enterprises, which provide students with vocational skills training. This combination fosters the enhancement of practical skills through hands-on experience, which in turn deepens students' understanding of theoretical concepts, creating a mutually reinforcing relationship [6]. Evans et al. (2023) argue that collaboration between universities and industry can enhance knowledge exchange and innovation, facilitating the digital transformation of organizations. Interviews with scholars and industry representatives revealed that universities and businesses must overcome barriers to establish more university-industry collaboration agreements. Supporting entities for such agreements are essential to drive innovation and digital business transformation [7]. The 'TAFE' model in Australia refers to Technical and Further Education, which evolved from the traditional master-apprentice teaching method into a modular classroom-based system. This approach integrates academic education with advanced technical job training, forming a unique vocational education system. As Hodge Steven (2016) noted, the key features of TAFE include a competency-based teaching philosophy, a highquality dual-teacher system, the National Qualifications Framework, and an industry-led governance mechanism [8].

(3) The problems existing in college-enterprise cooperation. Rybnicek et al. (2019) found that industry is one of the factors influencing the forms of university-industry collaboration, and the model of collaboration that applies to one sector is not universally applicable [9]. Yoshioka-Kobayashi et al. (2022) found that companies are more likely to renew or extend contracts when they perceive opportunities for technical knowledge

acquisition or joint technological research with universities. Schools that focus on academic research-related activities are more likely to establish long-term collaborations with businesses [10].

Zhao Zhaohui (2022) notes that while enterprises show strong interest in internship guidance, student employment, and project development, they are less enthusiastic about participating in professional construction, curriculum construction, on-campus and offcampus training base construction, student ability evaluation [11]. Lv Zhongda (2021) and others focus on teachers' motivation, observing a disparity where administrators are highly engaged while teachers remain lukewarm. This is attributed to teachers' relatively closed mindset and evaluation mechanisms, such as title evaluation systems, performance appraisals, and personnel policies, which dampen their willingness to cooperate with enterprises [12]. Finally, regarding operational mechanisms, Wang Zhenhong and Shao Jiandong (2012) emphasize the absence of mutually beneficial frameworks and long-term platforms for sustained cooperation between colleges and enterprises [13].

(4) The mechanism of college-enterprise cooperation. According to Emmenegger P (2019), collaboration between schools and enterprises can be categorized into four core tasks at regional, sectoral, and occupational levels: system development, content determination, fundraising, and the organization of training services. In this process, a platform is necessary for facilitating organizational involvement in the cooperation between educational institutions and businesses [14]. Cushla (2011), taking the Australian GIS as an example, pointed out that the GIS program, with the project as the implementation carrier, is essentially an optimized reorganization of production factors among different stakeholder subjects in the field of education based on the principles of efficiency and quality. It is essentially the optimization and reorganization of production factors among different stakeholders in the field of education based on the principles of efficiency and quality, mobilizing industrial enterprises to actively participate in the whole process of skilled personnel training, breaking down the barriers to personnel training and realizing the in-depth integration of universities and enterprises. Its operation system includes the selection of partners, the establishment of coordination and management mechanism, the formation of evaluation and feedback mechanism, the identification and sharing of problems, and finally, the formation of the cross-border mechanism of "positioning, coordination, feedback, and change," so as to promote the effective promotion of university-enterprise cooperation [15]. The improvement of teaching methods has received high attention in countries around the world [16,17]. The use of advanced theories and technologies to promote innovation in educational methods has become a consensus in the education industry [18].

There is no doubt that these literatures have important theoretical guiding value, but they do not fundamentally analyze the internal mechanism of college-enterprise cooperation in cultivating supply chain talents. Based on the relevant ideas of "Tao Te Ching", this paper leads the supply chain talent training base to the college-enterprise cooperation of supply chain talents, and focuses on the talent training mechanism of college-enterprise cooperation.

2. Related Theorems and Model

College-enterprise cooperation in cultivating supply chain talents refers to the

introduction of supply chain talent training bases in college-enterprise cooperation, in which the bases cooperate with typical colleges and digital supply chain service platforms to carry out supply chain talent training with strategic cooperation as the basic feature. To construct the model, this paper proposes the following four axioms:

Axiom 1: The process of supply chain optimization is a process of continuous outsourcing of non-core business.

Axiom 2: To promote the outsourcing of non-core supply chain business, it is important to give full play to the core enterprises serving as supply chain platform servicer.

Axiom 3: Giving full play to the role of supply chain platform services depends on the cooperative training of supply chain talents.

There is a strong linkage between the training of supply chain talents and the basic role of various supply chain platforms. The critical role played by supply chain platforms can better promote the continuous outsourcing of non-core business by enterprises, thus promoting the optimization, integration, and reengineering of supply chain processes, and thus promoting the cultivation of supply chain talents. In turn, it can further promote the sustainable improvement of the supply chain platform so that the cultivation of supply chain talents and the critical functions of the supply chain platform are in a benign linkage state.

Axiom 4: Collaborative training of supply chain talents is conducive to prying up a large market for supply chain talents training.

The cooperative training of supply chain talents is strongly linked to the synergistic role played by universities, colleges and supply chain enterprises. The key to whether universities and colleges can favor supply chain talents training is whether participating in supply chain talents training can help students' internships, employment and entrepreneurship. In order to solve this problem, it is necessary to give full play to the role of enterprises in order internship and training, especially the core enterprises of the supply chain.

As shown in formula (1), suppose that the value of supply chain talents training is V, Supply Chain Talent Brand Training Base (shorten as the Base), relevant colleges and universities, and supply chain core enterprises are j, l and m respectively, M is a constant determined by the latest supply chain talents qualification certificates and training system, etc., and n is the ordinal number of the core members of the Base, the relevant colleges and supply chain core enterprises.

$$V = M \left[\sum_{i=1}^{n} \sum_{l=1}^{n} \sum_{m=1}^{n} f(j, l, m) \right]$$
(1)

The formula means that the value of supply chain talent training is the result of the joint efforts of the core members of the base, relevant colleges and universities, and core enterprises in the supply chain. That is, it is a supply chain talent training mechanism jointly discussed, created, and shared by the core members of the base, relevant colleges and universities, and core enterprises in the supply chain.

3. Requirements for Supply Chain Talent Training Mechanism of Co-Discuss, Co-Create and Co-Share.

3.1. The Elaborate Construction of Supply Chain Talent Training Base

The increasingly uncertain domestic and international environment puts enterprises in the smile curve where traditional procurement is more problematic (see Figure 1) with poor toughness and safety. This is like an enterprise located at the bottom of a group of valleys or on a very low hill with poor roads, and its survival and development mode is weak. If an enterprise wants to go out of the valley bottom, it needs to have units or individuals to carry out supply chain engineering innovation that keeps pace with the times, and the supply chain talent training on its basis. As a result, the innovation and practice of supply chain, the beauty and the harmony and trust, naturally give birth to the requirements of supply chain talent training base construction. From this point of view, the training base is the product of nature in Taoism, which is "Tao begets one".

Traditional	Long lead time	Low efficiency	High cost	High frequency	High resource consumption
bidding and procurement	Multiple human factors	Unstable supply	Difficult to track performance	Unstandardi- zed operation	Difficult to close the loop of the process
issues	Non- transparent process	High risk of tampering	Greater regulatory difficulty	High cost of trust	Difficult to self- incriminate

Figure 1. Issues of traditional procurement



3.2. The Strategic Cooperation with Supply Chain Platform and Colleges

Tao begets one, that is, the elaborate construction of supply chain talent training base, is inseparable from the service support of the first-class supply chain platforms. Since the key to service support of the first-class supply chain platforms that keeps pace with the times is to solve the theoretical and practical problems in the process of supply chain non-core business outsourcing and supply chain platform outsourcing through precise cooperation between universities and enterprises, the cooperation between colleges and enterprises is very important. The key to one begets two is the cultivation bases carry out strategic cooperation with the first-class supply chain platforms and the typical institutions and relevant enterprises, which is to cultivate supply chain talent through college-enterprise cooperation. Due to the limited content of professional supply chain service platforms, a variety of supply chain platforms are needed to provide comprehensive supply chain engineering platform services (see Figure 2), which is to allow more small and medium-sized enterprises to get out of the bottom of the smile curve, to realize the efficient operation, rapid response, resilience and safety of supply chain engineering, and to continuously enhance the sustainable development ability of enterprises in market competition.



Figure 2. SMEs get out of the bottom of the smile curve through multiple supply chain engineering platform services

3.3. The Promotion of Linkage between Supply Chain Talents Training and Employment.

The principle of supply chain engineering system believes that the supply chain is a fourin-one organic overall system composed of interactive and interdependent supply chain business processes, supply chain hardware equipment, software technology and platform and supply chain ecology.

So, supply chain services can and must strive to enable many companies to enter one or several supply chains and engage in cooperative competition based on their expertise and advantages; transform the competition among abundant companies into a four-in-one supply chain cooperative competition, which is to systematically and comprehensively solve problems such as information asymmetry, disordered competition, relationship game, and risk-based cooperation (see Figure 3).

Figure 3 illustrates the three axes of supply chain outsourcing, supply chain platform services and supply chain integration. In general, enterprises realize supply chain integration through non-core business outsourcing, which further promotes enterprises, especially supply chain service platform enterprises, to become stronger and bigger. At this time, the well-developed enterprise may progressively become the core enterprise, which is shown in Figure 3. That is, the outsourcing of non-core business of the supply chain promotes the integration of the supply chain of the enterprise and the role of the supply chain business service platform, which is also the main meaning of classic supply chain management.



Figure 3. Supply chain outsourcing - integration: platform linkage evolution diagram

However, in the case of increasingly fierce competition among enterprises in China and a big number of enterprises facing elimination, some wise enterprises do not want to do a senseless struggle, but take advantage of the fact that there are many choices to sell some of their resources, factors, and even the entire enterprise, or invest in some strong enterprises with good growth, which is shown as 4-6 in Figure 3. That is, the development of the supply chain platform promotes the outsourcing of non-core supply chain business, and then promotes the integration of the industrial supply chain and the generation and development of a higher-level supply chain element service platform. This is the growth of the core enterprise group of "gathering sand into a tower" and the integration of the supply chain and the industrial chain on the base of it.

Then, through wider and deeper cooperation, especially through the construction of the supply chain engineering system network platform and the development of business activities, the integration of supply chain engineering will be further realized and strengthened. This kind of supply engineering integration with capital equity, trust culture and supply chain engineering technology methods as the basic starting point has a strong resource concentration, which can better solve the problems of insufficient demand in the process of enterprise development and platform construction, which is shown as 7-8 in Figure 3. That is, the development of the supply chain element platform promotes the outsourcing of non-core supply chain engineering businesses, and then promotes the generation and development of a higher-level industry-national supply chain integration and a deeper supply chain basic service platform. Of course, at present, this is more of a possible idea or development trend, whether it can be successfully realized still faces many cross-chain challenges and related risk prevention. But in any case, this has provided a way for the vast majority enterprises to get rid of the dilemma of survival and development, and become stronger.

4. Conclusion and Inspiration

As a strategic emerging profession, the training of supply chain talents is related to the resilience, security and economic development of enterprises, industrial and national supply chains. The process of supply chain optimization is a process of continuous outsourcing of non-core businesses, which focuses on playing the role of supply chain platform service of core enterprises, and emphasizes the training value of co-discuss, co-create and co-share of supply chain talents. That is, it is a supply chain talent training mechanism jointly discussed, created, and shared by the core members of the base, relevant colleges and universities, and core enterprises in the supply chain. That is, the core members of the training base, relevant colleges and universities, and core supply chain talent training. "Tao begets one, one begets two, and two begets three" is the important theoretical basis of Chinese Taoism, which is also the ideological basis and practical point of the Base and college-enterprise cooperation to cultivate supply chain talents. The important inspirations and suggestions are as follows:

(1) The main body of talent cultivation is to be matched and adapted from the perspective of "Tao begets one". Talent cultivation, especially the cultivation of emerging applied talents, should keep pace with the times and pay attention to social concerns, and promptly adjust training programs, content and methods. In particular, effort should be made in the self-construction of training bases, so as to adapt to environmental changes and lay an important "Tao Sheng Yi" foundation for sustainable training.

(2) All parties involved in college-enterprise cooperation intend to attach great importance to the creation and service of the supply chain platform from the perspective of "one begets two". The training of talents of all parties, especially the training of emerging application-oriented talents, should be connected with the service role of the supply chain platform, and actively use the relationship between the supply chain platform and the outsourcing of supply chain business to promote each other, so as to provide extensive and important scenarios for the majority of students to practice, employment and innovation. At the same time, it also provides a space for students to provide professional services with related enterprises on the platform, to realize the linkage and integration of talent training and enterprise employment, and better achieve the effect of "one begets two".

(3) All parties involved in the college-enterprise cooperation intend to actively carry out the four-in-one supply chain talent training, especially the training of emerging application-oriented supply chain talents. They should focus on the four-in-one of supply chain business processes, supply chain hardware equipment, software technology and platform and supply chain ecology, to better promote the coordinated evolution of supply chain outsourcing-integration-platform and promote the coordinated solution of problems such as information asymmetry, disordered competition, relationship game, and risky cooperation. That is, to achieve the high-quality development effect of the supply chain of "two begets three, three begets all things".

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