



RESEARCH ARTICLE

Establish a Model About the Effectiveness of University-Enterprise Cooperation

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ARTICLE INFO	ABSTRACT
Received: May 21, 2024 Accepted: Jul 6, 2024	In the era of knowledge economy, university-enterprise cooperation can not only contribute to knowledge innovation, but also help promote the industrialization process of scientific and technological achievements. Especially under fierce international competition and huge pressure for technological innovation, the significance of university-enterprise cooperation has become increasingly important. Although China has achieved relatively fruitful results in theoretical research on university-enterprise cooperation, many problems have been exposed in practice. For example, the cooperative relationship between universities and enterprises is unstable. Universities and enterprises have great heterogeneity, fail to integrate effectively, and the cooperation performance is not ideal. There is insufficient in-depth cooperation between universities and enterprises, which hinders the process of university-enterprise cooperation. This study focuses on clarifying the causal relationship between university-enterprise knowledge sharing capability, university-enterprise cooperation motivation, university-enterprise effective communication capability and university-enterprise conflict management on university-enterprise cooperation effectiveness, as well as the moderating role of the external environment. This will promote the development of university-enterprise cooperation, improve the quality of university-enterprise cooperation, and provide theoretical basis and practical reference for national government departments, enterprises and university management departments to formulate scientific and reasonable cooperation policies.
Keywords University-enterprise cooperation Effectiveness Capability Motivation	
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INTRODUCTION

From the general trend of world economic and social development, university-enterprise cooperation is the requirement for developing countries to achieve historic catch-up. From the historical development process, university-enterprise cooperation is an inevitable requirement for the development of productive forces to a certain stage (Sun, 2022). However, with the rapid development of China's social economy, if organizations in all walks of life want to survive and develop in today's highly competitive environment, the way of going it alone has become inappropriate (Gao & Li, 2018). University-enterprise cooperation has become an important way to cultivate higher-level human resources for current economic development. Promoting university-enterprise cooperation and guiding enterprises to participate in college talent training is conducive to technological innovation and industrial structure transformation and upgrading of enterprises, and high-quality development of enterprises, thus improving the speed of economic development (Gong, 2020).

In recent years, the Chinese government has also shown great concern and support for personnel training and enterprise development mode of university-enterprise cooperation. As an important breakthrough in technological innovation, university-enterprise cooperation has become an important measure to build an innovation-oriented country. However, the content of university-enterprise cooperation system is general, not specific, not flexible, lagging behind the needs of social development (Fang & Yan, 2021). Therefore, it is urgent to strengthen the research of university-enterprise cooperation, especially the effectiveness of university-enterprise cooperation.

With the increasing attention of all sectors of society to university-enterprise cooperation, it has become an issue of concern to find out the influencing factors of the development of university-enterprise cooperation and how to improve the effectiveness of university-enterprise cooperation. The main performance is as follows: the overall participation of enterprises is more, but the participation degree is not deep (Guo, 2019). There is a disconnect between college talent training and the actual talent skill demand of enterprises, and there is a gap between the professional level of graduates and the actual demand of enterprises. There is an obvious lack of sound communication among participants, and problems exist in many aspects such as goals, systems, benefits and docking (Kong & Ye & Zhang, 2022).

With the rapid development of China's social economy, the structural contradiction between education supply and industrial demand has become increasingly apparent, mainly reflected in the type structural contradiction, level structural contradiction and professional structural contradiction between talent supply and demand (Kong & Ye & Zhang, 2022). In terms of the type of structural contradiction between talent supply and demand, there is a large gap between the supply and demand of high-skilled labor in China. According to the release of CCTV network on May 14, 2023, the current skilled workers in China account for only 29% of the total employment population, and high-skilled talents only account for 30% of the total skilled talents. It is difficult for technical and skilled talents to meet the needs of the industry, leading to the shortage of technical and skilled talents in enterprises on the one hand, and employment difficulties for college graduates on the other hand. In terms of the hierarchical structural contradiction between the supply and demand of talents, some local undergraduate colleges and universities cannot properly adhere to the educational orientation of training technical talents for regional economic development, and blindly pursue higher level graduate education. To a certain extent, the supply of graduate students exceeds the actual demand of the labor market, and the phenomenon of excessive education is generated in some regions and industries. In terms of the professional structural contradiction between talent supply and demand, some colleges and universities have mismatched the national economic structure and regional industrial structure, and failed to establish an efficient dynamic adjustment mechanism for professional structure, resulting in an imbalance between talent supply and industrial demand for some majors (Chen, 2023). The homogenization of colleges and universities not only causes the waste of higher education resources, but also affects the function of higher education to serve the economic and social development, and aggravates the employment difficulties of college students.

In recent years, university-enterprise cooperation has risen to the national strategy of China (Zhou, 2021), and it still faces many difficulties in the process of deepening development. First, the connection channels between universities and enterprises are not smooth in the process of cooperation. No matter universities or enterprises, the channels for the release and acquisition of talents, scientific and technological achievements, knowledge and information are relatively simple. In many cases, universities or enterprises take the initiative to contact them unilaterally, and government departments and social organizations play a very limited role in the cooperation between schools and enterprises. In the process of cooperation, when there are problems or conflicts, the communication and coordination between universities and enterprises are mostly at a shallow level, and sometimes they are even solved through negotiation in personal relationships, while institutionalized communication and coordination and information docking channels have not been

effectively established. Second, the government's positioning in university-enterprise cooperation is inaccurate. From the perspective of resource allocation, the problem of university-enterprise cooperation should be solved by the market (Xu, 2020). However, if the government's guiding function is absent and excessive dependence on the market will lead to the profit-making demands of enterprises and the public welfare culture of universities, and the university-enterprise cooperation subjects will lose their due cooperation motivation. Third, the supporting system has not been established systematically. Although favorable policies have been successively introduced at the national level, the supporting policies of local governments are not perfect enough, and there is also a lack of systematic supporting policies for the distribution of benefits and the division of responsibilities between universities and enterprises in cooperation, which affects the stability and depth of university-enterprise cooperation (Hao, 2019).

In summary, this study focuses on clarifying the relationship between university-enterprise knowledge sharing capability, university-enterprise cooperation motivation, university-enterprise effective communication capability and university-enterprise conflict management on the effectiveness of university-enterprise cooperation, so as to form an effective university-enterprise cooperation model, optimize the cooperation environment, promote the development of university-enterprise cooperation, improve the quality of university-enterprise cooperation, and lead the social and economic development.

Objective

1. To find the factors that affect the effectiveness of university-enterprise cooperation.
2. To find the relationship between factors influencing university-enterprise cooperation.
3. To find the measures to improve the effectiveness of university-enterprise cooperation.

LITERATURE REVIEW

University-enterprise Knowledge Sharing Capability

As for the connotation of knowledge sharing, many scholars have made different expressions from various perspectives, which are summarized in Table 1.

Table.1:Research summary of knowledge sharing definition

Definition	Representative Personage
Knowledge sharing is not only a process of sharing existing knowledge, but also a process of creating new knowledge, that is, when two parties share existing knowledge, new knowledge will be created at the same time	Eriksson & Dickson, 2000
Knowledge sharing is a process in which individuals exchange information, views, suggestions and expertise related to specific work tasks with others. It is also a behavior of individuals disseminating information among organizations	Bartol & Srivastava, 2002
Knowledge sharing is the process of transforming knowledge from oneself into knowledge that can be understood by others, and the process of transforming knowledge held by individuals into a form that can be understood, absorbed and used by others. Knowledge sharing means that knowledge senders do not give up ownership of knowledge, on the contrary, knowledge sharing will lead to knowledge senders and receivers of shared ownership of knowledge	Ipe, 2003
Knowledge sharing refers to: knowledge transfer is the process of knowledge sharing, organizational learning is the means of knowledge sharing, and knowledge creation is the purpose of knowledge sharing	Kaser et al., 2005

Knowledge sharing is a kind of personal knowledge sharing behavior, which breaks through the boundary between individuals and organizations to obtain knowledge in the work, and eventually becomes the knowledge reserve, organizational convention or successful practice of the organization	Bock et al., 2005
Knowledge sharing is the process of knowledge transfer, transmission and communication in the organization	National Standardization Administration, 2009
Knowledge sharing refers to the process in which individuals, teams and organizations within an organization share all kinds of knowledge through various sharing means, including explicit knowledge and implicit knowledge, or information, views, suggestions, expertise or experience, etc., through digestion and absorption to achieve knowledge transformation and creation	Xu, 2011
Knowledge sharing is a process of mutual communication between people with different knowledge reserves in order to obtain the knowledge they do not have but need through constant absorption, digestion, application and innovation of knowledge, and finally transform individual knowledge into the whole knowledge of the team, so that individual and team knowledge can be added value	Chen et al., 2013

Through sorting out the representative definition of knowledge sharing, we can conclude the following points: First, knowledge sharing must have an agent. An agent can be a knowledge provider who externalizes its own knowledge, or a knowledge receiver who internalizes the received knowledge. The status of knowledge provider and knowledge receiver is interchangeable, that is to say, the knowledge sharing subject has the dual ability of knowledge provider and knowledge receiver at the same time. Second, knowledge sharing is a two-way interactive process. It is a two-way interactive behavior process of mutual communication, exchange and learning between the sharing subjects. Through the process of two-way interaction between subjects, they can help themselves, or help others develop new abilities of action or co-create new knowledge. Third, the object of knowledge sharing includes explicit knowledge and tacit knowledge. To realize the two-way flow of these two kinds of knowledge between sharing subjects, it is necessary to share knowledge channels or means. Fourth, knowledge sharing can take place at different levels, such as individual, team, organization and inter-organization.

As knowledge sharing is a concept with rich connotations, previous literature shows that the measurement of knowledge sharing focuses on the measurement of knowledge sharing behavior, the measurement of knowledge analysis results, the measurement of knowledge sharing content, the measurement of knowledge absorption, and the measurement of knowledge acquisition. At present, a large number of researchers are trying to understand knowledge sharing practice from different research perspectives and divide it into different dimensions, mainly including single dimensions and multiple dimensions.

According to the direction of knowledge flow, Scholars such as Van den Hooff & De Bidder (2004) and Van den Hooff & Huysman (2009) divide knowledge sharing behavior into knowledge donating and knowledge collecting two dimensions. Among them, knowledge contribution refers to the behavior of an individual, a team, or an organization member to share their knowledge and skills with other individuals, teams, or organization members; Knowledge collection refers to the behavior of an individual, team, or organization member to actively consult or teach other individuals, team or organization members about relevant knowledge and skills.

Table.2 : Measurement dimensions of knowledge sharing capability

Dimension	Author
Knowledge donating Knowledge collecting	Van den Hooff & De Bidder, 2004; Van den Hooff & Huysman, 2009; Dai & Hu, 2016; Li et al, 2011; Pan, 2013

With the deepening of research on knowledge sharing, based on the collation and summary of literature, this study defines the university-enterprise knowledge sharing capability as the two-way interactive ability between knowledge providers and knowledge receivers to communicate, exchange and learn each other's knowledge through various sharing channels and means, so as to help themselves or each other develop new actions or jointly create new knowledge, and improve the overall utility of knowledge. At the same time, based on the systematic classification of the dimensions of knowledge sharing by many scholars, this study believes that the university-enterprise knowledge sharing capability can be divided into two dimensions: knowledge donating and knowledge collecting. This is because many scholars generally agree that knowledge sharing is divided into two dimensions: donating and collecting. In the process of university-enterprise cooperation with intensive knowledge activities, the cooperative subjects can only donate and collect to shared knowledge. Secondly, in the context of university-enterprise cooperation, knowledge donating capability and knowledge collecting capability have a greater impact on the efficiency and effectiveness of cooperation, and have more value.

University-enterprise Cooperation Motivation

Motive power, defined in the Chinese Dictionary (1992), refers to the various forces that make a machine do work, such as hydraulic, wind, electricity, animal force, etc. The second is to compare the forces that promote the advancement and development of work and career, such as the motivation of learning and the motivation of revolution. In short, motivation mainly refers to the force that pushes things forward.

Table 3: Comparison of cooperation motivation between universities and enterprises

Motivation	University	Enterprise
Necessity	Responding to relevant government policies; Align with University strategic policy initiatives	Responding to relevant government policies and incentives; Comply with corporate strategic policy initiatives
Reciprocity	Acquire the enterprise's professional technology and current instruments and equipment; Improve internship and employment opportunities for students	Access to the university's high-quality, high-quality human resources
Efficiency	Obtaining funding for scientific research; Access to knowledge and technology for application in the industry; Improve the economic benefits of university researchers	Obtaining government incentive subsidies; Gain the benefits of commercialization of university scientific research technology; Save research and development costs; Enhance their own technical capabilities, improve market competitiveness;
Stability	Discover new knowledge for application verification; Opportunities for teachers and students to learn about practical	Acquire new knowledge, new technology, and experience in the application of professional skills; Solve specific technical problems;

	problems and applied technologies in the industry; Improve the quantity and quality of academic papers published	Improve their own research and development capabilities; Achieve their own development, improve competitiveness
Legitimacy	Public opinion pressure; The needs of industry and society; Promoting innovation capacity through technology exchange; Contribute to economic development	Enhance the image and reputation of the enterprise
Asymmetry		Control over patented technology

Based on Iorio's dimension of university-enterprise cooperation motivation, this study divides university-enterprise cooperation motivation into funding motivation, learning motivation, and mission motivation.

The motivation for funding mainly refers to obtaining financial compensation to support research in the process of university-enterprise cooperation (Lam, 2011; Iorio et al., 2017; Hung et al., 2011). Lam (2011) pointed out that funding motivation includes not only internal rewards, which can obtain more resources for research but also external rewards, such as increasing income. Although some studies have found that monetary incentives play an important role in the whole process of technology transfer (Friedman & Silberman, 2003; Albert et al., 2005), other studies have found that the encouragement of this currency is more important in the process of patent and derivative enterprises (D'Este & Perkmann, 2011; Muscio et al., 2016). Although scholars have realized the value of university-enterprise cooperation, a realistic problem they have to face is that scholars give priority to salary and only consider other motivations when considering cooperation (Malik, 2013).

Learning motivation mainly refers to obtaining complementary assets and exchanging ideas in the process of cooperation with enterprises, to improve scholars' research (Iorio et al., 2017). The motivation to learn is embodied in the acquisition of complementary abilities, the exchange of ideas and experiences, a strong research inclination, further insights in the field of personal research, the provision of on-site experiences for students, and the provision of employment opportunities for students, etc. (Lam, 2011; Iorio et al., 2017). It is found that scholars who are often driven by learning motivation are more likely to establish long-term cooperative relations and build a common knowledge base in the process of school-enterprise cooperation, and the trust relationship is stronger, which is conducive to solving complex problems and exchanging tacit knowledge (Baba et al., 2009; Iorio et al., 2017).

The traditional mission of a university is to teach, research, and serve the industry. However, some scholars call for the third mission of a university, to be an entrepreneurial university and contribute to the development of the national economy (Etzkowitz, 1998; Etzkowitz et al., 2000; Huang & Chen, 2016). Therefore, the university encourages and promotes the participation of faculty and students in innovative and entrepreneurial activities through various mechanisms. For universities, proper commercialization activities are conducive to maximizing their contributions to society (Huang & Chen, 2016). Therefore, mission dynamics are mainly the dynamics that embody prosocial behavior and achieve the social impact of research (Iorio et al., 2017). The mission of a university is to generate new knowledge, while the mission of a business is to generate profit from research (Ramli & Senin, 2015). Rizzo (2015) found in his research that some scientists are mainly driven by mission drive when they cooperate with SMEs to conduct knowledge transfer and realize their desire to contribute to society.

Table 3: Measurement dimensions of university-enterprise cooperation motivation

Dimension	Author
Funding motivation	Iorio et al., 2017; Huang, 2018
Learning motivation	
Mission motivation	

Motivation is the psychological tendency or driving force that stimulates and sustains an individual's behavior. In the process of university-enterprise cooperation, the willingness of universities, enterprises, governments and other organizations and their personnel to participate in and deepen university-enterprise cooperation is defined as the driving force of university-enterprise cooperation. At the same time, this study uses Iorio's dimension of university-enterprise cooperation motivation to measure funding motivation, learning motivation and mission motivation.

University-enterprise Effective Communication Capability

The Chinese character communication means "to share", to establish common views, to communicate, to convey, and so on. Experts and scholars in different fields have given different explanations and definitions of communication. Scholars studying communication emphasize the channels and elements of communication and believe that communication is the social interaction process in which information, concepts, or ideas pass through certain channels between people to achieve certain results (Claus & Kesting, 2017). Scholars in social psychology emphasize social and psychological processes and divide the concept of communication into narrow communication and broad communication. In the narrow sense, communication refers to the transmission of information, symbols, and signs between people; The broad sense of communication includes not only the transmission of information between individuals but also the behavior of all interaction processes of social activities between individuals (Guan et al., 2005). Scholars engaged in management studies emphasize the process, subject participation, and exchange of communication, and believe that communication is the process of information transmission from knowledge sender to knowledge receiver, and the result of communication depends on the ability of participants to understand information and its interrelation (Wu, 2017).

In the process of university-enterprise cooperation, universities, enterprises and governments all have heterogeneous information resources and advantages, and effective communication provides a necessary prerequisite for reducing transaction costs in the process of cooperation. Chen (2017) proposed in his research that the university-enterprise cooperation communication and coordination mechanism refers to the establishment of a certain authoritative and normative communication platform composed of different cooperative subjects, which provides information communication for the interest game of multiple subjects and enables the interest demands of multiple subjects to be fully expressed. According to the forms of communication and coordination between multiple subjects, the communication and coordination mechanism of university-enterprise cooperation can be constructed from the joint conference system of university-enterprise cooperation, the information service platform of university-enterprise cooperation, and the coordination and guidance of industry organizations.

Zhu (2016) proposed that university-enterprise cooperation includes personnel training, technological innovation, capital investment and other aspects. In order to ensure its normal establishment and operation, it is necessary to establish and improve the organization, management and coordination mechanism and communication mechanism, and establish corresponding organizations responsible for communication and liaison, so as to promote the implementation of university-enterprise cooperation projects through effective communication. The effectiveness of university-enterprise cooperation is closely related to communication channels and information transmission. As an important means for colleges and universities to enhance their competitiveness, the lack of information communication and cooperation channels has become a serious obstacle to the development of university-enterprise cooperation. Many researchers have put forward the

problem of communication and liaison barriers in university-enterprise cooperation. R.e.lima Artinez et al. (2004) conducted an empirical study on a case in Mexico and showed that good communication channels and methods had a positive impact on university-enterprise cooperation behavior. Therefore, in addition to the establishment of communication institutions between universities and enterprises, it is necessary to improve the communication mechanism, and set up a number of working groups in the institutions to organize universities and enterprises to participate in the planning and research of cooperative projects, and deal with various contradictions and problems in the process of practical teaching.

The information communication of university-enterprise cooperation includes two levels of contact. First, the understanding and contact between the demand information of enterprises and the technology supply information of universities before the cooperation relationship is reached; Second, communication and liaison between the two sides in the process of cooperation.

Table 4: Measurement dimensions of effective communication capability

Dimension	Content description	Author
Interaction frequency	The frequency of effective communication between cooperating organizations	Santoro & Chakrabarti, 2002
Problem-solving attitude satisfaction	The degree to which both parties are satisfied with their behavior and attitude in the face of cooperation and problems or conflicts between members	Barnes et al., 2002
Rapport degree	The degree to which cooperative organizations interact is good or bad	Perkmann & Salter, 2012

The process of university-enterprise cooperation is a complicated one, and the whole process is affected by the internal factors of the cooperative subjects, among which the effective communication capability of university-enterprise cooperation plays an important role. If both parties of university-enterprise cooperation have strong communication skills, it can promote university-enterprise cooperation to achieve 1+1>2 mutually beneficial and win-win results. Therefore, according to the literature review, this study defines university-enterprise effective communication capability as the ability of university-enterprise cooperative subjects to treat and deal with university-enterprise cooperation problems and contradictions in the cooperation process, such as providing information communication for interest games, successfully delivering information to the communication object, and the communication object can respond as expected, so that the interest demands of the cooperation subject can be fully expressed. At the same time, the effective communication capability of university-enterprise cooperation is considered from the interaction frequent, problem-solving attitude satisfaction and rapport degree.

University-Enterprise Conflict Management

In management science, Hellriegel et al (1989) believes that conflict is a situation of contradiction, exclusion and confrontation between two or more actors due to their inconsistent goals, views, approaches or opinions on management issues. In social behavior, Stephen P. Robbins (2005) defines conflict as a process that begins when one party perceives that the other party has a negative impact or will have a negative impact on something they care about. Subsequently, the research results of Qiao & Chen (2010), Cheng (2011), Liu & Zhao (2012), Sun & Zhang (2014) and others showed that due to the continuous development of politics, economy, technology, culture and other aspects, various conflicts have appeared in many fields, and conflicts have become a common phenomenon in society. Therefore, the ability to manage conflicts plays an important role in the development of organizations or groups.

Gresch (1985) believes that conflict management is the decision or plan to identify, understand, describe, reduce conflict, and finally make conflict-handling situations. According to Susskind (1985), a good conflict management model should at least include meeting the needs of the parties to the

conflict, safeguarding the rights and interests of both parties, having practical and legal procedures, considering the uncertainty of the conflict, and quickly reaching and improving the conditions of the conflict between the two parties. However, scholar Barker (1987) believes that conflict management refers to the promotion of communication barriers among team members, the definition of the mission of interdependence and mutual assistance among team members, the identification of the key issues, the search for common resources for scientific research, and the taking of joint actions to remove certain specific problems causing conflicts among team members under the precondition of team development. As a management skill, management can be divided into broad sense and narrow sense. In a broad sense, conflict management refers to the whole process of the conflict subject's identification, analysis, treatment, and resolution, that is, from the possibility of conflict to the understanding of conflict to the outbreak of conflict to the treatment of conflict, and finally to the formation of conflict resolution. In the narrow sense, conflicts only focus on the causes of conflicts, behaviors of conflicts, and ways to deal with conflicts, and study the internal correlation, special nature, and coping strategies of conflicts in these three stages, to achieve effective management of conflicts (Ma, 2002). G. Richard Shell (2001) pointed out that conflict management refers to the application of different strategies and action intentions in conflict handling, which means comprehensively and systematically coordinating the relationship among participants in a project using various strategies, to eliminate possible conflicts while ensuring smooth progress of the project and effectively deal with all kinds of conflicts that have emerged (Xi, 2015).

Many scholars have studied the specific ways of conflict management from different perspectives. For example, Rahim, M.A. (1992) believes that conflict is mainly a process of mismatch or inconsistent interaction between social subjects and entities. According to Deng (2011), based on the three-dimensional model of conflict handling strategies constructed by Ruble and Thomas, six conflict management methods were analyzed and the key measures to deal with cooperative conflict management in modern enterprises were obtained. Yu & Jiang & Zhao (2015) believe that cooperative conflict management style and competitive management style have an impact on employee voice behavior, and psychological security can mediate the relationship between conflict and employees. Peng (2012) believes that in the context of today's complex organizational environment, by solving the problem of conceptual conflict within organizations, a harmonious and stable cooperation mechanism can be scientifically constructed to inject vitality into the development of enterprises.

Based on previous literature studies, due to the differences in the role positioning, resources and capabilities, development goals, and other aspects of university-enterprise cooperation subjects, it is easy to form different or even potentially opposing codes of conduct, which will reduce the quality of university-enterprise cooperation. This study believes that university-enterprise conflict management is to timely and effectively urge cooperative subjects to jointly solve cooperative contradictions, manage and stabilize the relationship between cooperative subjects, and ensure orderly and long-term university-enterprise cooperation.

Table 5: Measurement dimensions of university-enterprise conflict management

Dimension	Author
Strategic objectives	Swoboda, 2018; Han, 2014; Wu & Li, 2010
Organizational culture	
Profit distribution	
Contract terms	

In the process of university-enterprise cooperation, universities and enterprises usually carry out interaction and cooperation based on their own goals and interests. In the whole process, universities have educational attributes, while enterprises have management attributes. In the process of cooperation, there will be all kinds of conflicts. How to solve the conflicts effectively and reasonably is particularly important for the effect of cooperation? Therefore, this study defines university-

enterprise conflict management as urging cooperative subjects to solve cooperative conflicts timely and effectively, managing and stabilizing the relationship between cooperative subjects, and ensuring orderly and long-term university-enterprise cooperation. And from the strategic objectives, organizational culture, profit distribution, contract terms of four dimensions of university-enterprise cooperation conflict management measurement and research.

University-enterprise Cooperation Effectiveness

As a concept, effectiveness has the common characteristics of many concepts, and integrates the personalized connotation of many concepts, and has the meaning of efficiency, benefit, effect, validity and efficiency. Mungra & Yadav (2019) proposed that effectiveness is the overall satisfaction of inter-agent relationship. Suh et al (2019) defined the effectiveness of university-enterprise cooperation as the satisfaction and effect obtained by the participants through participating in the cooperation activities, that is, the level of the participants' perception of the cooperation experience must meet or exceed the initial expectation on the results of university-enterprise cooperation. Chen (2022) pointed out that the effectiveness of university-enterprise cooperation refers to the effect of the implementation of university-enterprise cooperation, which means that after a period of university-enterprise cooperation, students can make concrete progress or development in the practical operation of skills. Universities, enterprises and the government get a high degree of satisfaction through university-enterprise cooperation.

In the process of university-enterprise cooperation, the differences of cooperation objectives and resource input among cooperative subjects, as well as the embeddedness of hidden knowledge in the process of cooperation, lead to complex and diverse connotations of cooperation performance, which makes it difficult to evaluate the value of cooperation achievements by using objective output indicators to measure their effectiveness (Perkmann et al., 2011; Galan-Muros & Davey, 2019). On the other hand, due to the time lag, it is difficult to commercialize the scientific research results achieved by university-enterprise cooperation in the short term (Caniels & Bosch, 2011). Therefore, Kale et al. (2002) believes that adopting some subjective indicators can more truly and directly reflect enterprises' evaluation of cooperation process, cooperation relationship and cooperation results. Some other scholars believe that the research on the effectiveness of university-enterprise cooperation can refer to the contents of the existing research on the satisfaction of the cooperative relationship, the continuity of the cooperative relationship and the cooperation results (Zollo et al., 2002; Mora-Valentin et al., 2004; Li et al., 2012; Li, 2011).

Through reviewing relevant literature, it is found that Li et al. (2012) evaluated the effectiveness of university-enterprise cooperation from four aspects: cooperation harvest, cooperation relationship, emotion, and trust. Wei et al. (2013) measured the effectiveness of university-enterprise cooperation from four aspects: willingness to cooperate, perception of cooperation results, contribution of partners, and cooperation process. Guan & Wang (2015) evaluated the effectiveness of university-enterprise cooperation from the aspects of cooperation outcomes, cooperation relationships, and competitive advantages.

Table 6: Measurement dimensions of university-enterprise cooperation effectiveness

Dimension	Author
Cooperation achievement	Guan & Wang, 2015; Lee et al., 2016; Li et al., 2012; Wei et al., 2013; Dai & Hu, 2016b
Cooperation relationship	
Willingness to continue with cooperation	

To sum up, in the university-enterprise cooperation relationship, if the partners can achieve specific progress and development in relevant fields, and both parties can obtain a high degree of cooperation satisfaction, then such cooperation is effective. Therefore, this study defines the effectiveness of university-enterprise cooperation as the objective product of university-enterprise cooperation activities, which is a subjective evaluation of cooperative subjects on the process and output of

cooperative activities and their willingness to continue cooperation. At the same time, through literature review, the effectiveness of university-enterprise cooperation is measured from the aspects of cooperation achievement, cooperation relationship, and willingness to continue cooperation.

External Environment

Ling et al. (2015) pointed out that the external environment of university-enterprise cooperation ecosystem includes political system, culture and technology, regional transportation, economic level, industrial development, laws and regulations, etc. Liu (2019) believes that the external environment of university-enterprise cooperation mainly includes macro-policy environment, regional economic development environment, social and cultural environment and scientific and technological environment. Cen (2019) believes that the external environment of university-enterprise cooperation includes economic, social, industrial, policy, cultural and natural environment. Lu et al. (2019) believe that the effectiveness of university-enterprise cooperation should be studied from the macro environment levels of economy, politics, culture, society, system and so on. For university-enterprise cooperation, the external environment refers to the sum of all external factors that affect the activities of university-enterprise cooperation subjects (Chen, 2022).

Based on the existing literature review, this study defines the external environment of university-enterprise cooperation as the external environmental factors that affect the activities of university-enterprise cooperation subjects, and adopts three dimensions of economic environment, social environment and institutional environment to measure and study them.

According to the review of previous literature, most scholars usually measure the external environment of university-enterprise cooperation from multiple dimensions, such as economic environment, social environment, technical environment, and institutional environment (Ling, 2015; Liu, 2019; Lu et al., 2019; Chen 2022). Many scholars also measure the external environment of university-enterprise cooperation from the perspective of the government, including policy support, service guarantee, and overall planning.

Table 7: Measurement dimensions of the external environment

Dimension	Content description	Author
Economic environment	Urban industrial institutions	Mou, 2018; Liu, 2019; Yu et al., 2020; Tu et al., 2018; Tang et al., 2020
	Urban platform carrier	Li et al., 2020; Chen, 2020; Hu, 2019; Zhu, 2019; Zhang, 2020
Social environment	Social identity	Liu, 2019; Wang, 2019; Cao, 2019
	Cultural atmosphere	Liu et al., 2015
Institutional environment	Macro policies and regulations	He et al., 2018; Hu et al., 2019; He et al., 2021; Li et al., 2021; Liu, 2019; Fang et al., 2021; Li 2017
	Micro-subject system	Wang, 2017; Sun et al., 2021; Huo 2018; Shi et al., 2019

Conceptual Framework

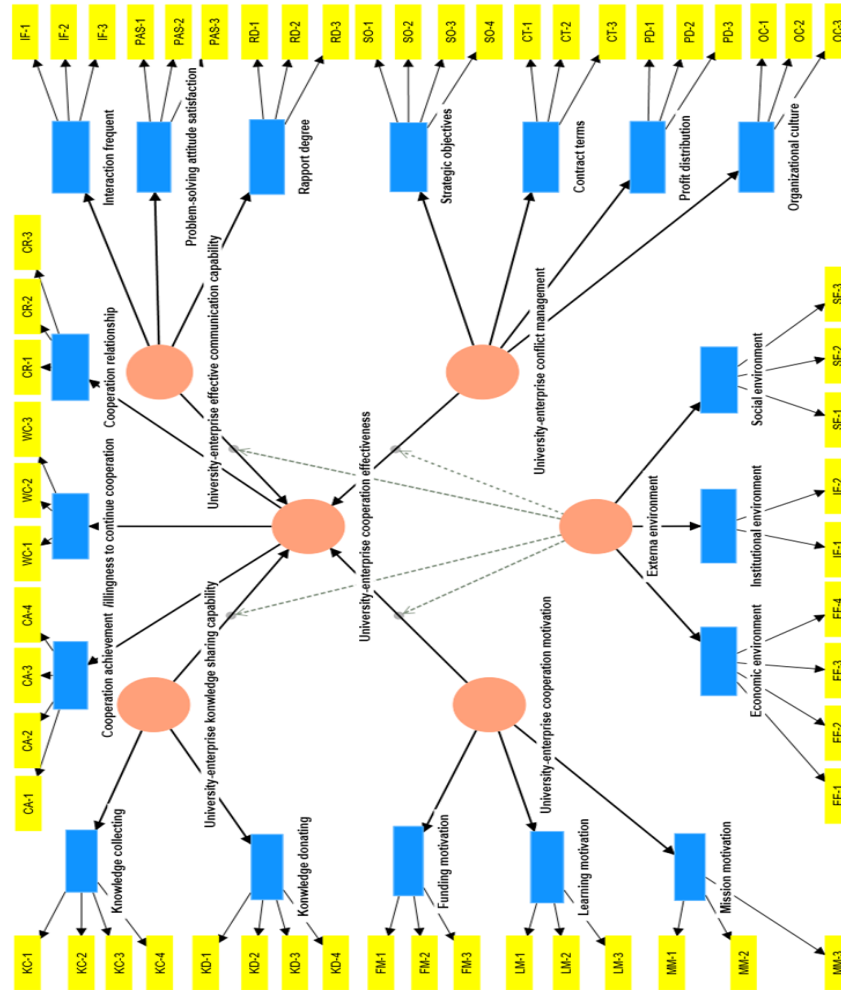


Figure 1 Conceptual Framework

This study has 4 independent variables, a dependent variable and a moderator variable. Independent variables include university-enterprise knowledge sharing capability, university-enterprise cooperation motivation, university-enterprise effective communication capability, university-enterprise conflict management. Dependent variable is university-enterprise cooperation effectiveness. Moderating variable is external environment.

CONCLUSION AND FUTURE WORK

In this study, we developed a model of the relationship between university-enterprise knowledge sharing capability, university-enterprise cooperation motivation, university-enterprise effective communication capability, university-enterprise conflict management and the effectiveness of university-enterprise cooperation, based on the moderating effect of external environment.

First, we recall that the core goal of university-enterprise cooperation is to promote knowledge sharing, technological innovation and industrial development. This study starts from the effectiveness of university-enterprise cooperation, finds out the influencing factors of university-enterprise cooperation, builds a theoretical model, and provides a reference for the theoretical problems missing in the academic research results. At the same time, this study will adopt mixed research methods to explore the essence of university-enterprise cooperation and better guide the smooth cooperation between universities and enterprises. However, we also recognize the

limitations of the study, which focuses on specific regions and may not be fully representative of all types of university-enterprise cooperation. Therefore, future research should expand to a wider range of fields and regions to gain a more comprehensive perspective.

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