GENERATED PATH OF SYNERGISTIC EFFECT OF COLLABORATIVE INNOVATION OF UNIVERSITY-INDUSTRY COOPERATION

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Abstract

Based on the construction of international free trade port in Hainan, this study aims to analyze the existing problems in the development of internationalization of hig This paper explores the synergistic effects arising from collaborative innovation between universities and industries, emphasizing the transformative trends shaping higher education. As universities increasingly adopt flexible educational policies and prioritize the cultivation of innovative spirit and practical skills, the dynamics of industry-academia partnerships have evolved significantly. This study highlights the integration of collaborative approaches that enhance knowledge transfer, drive technological advancement, and prepare students with competencies aligned to market demands. In the context of China, the evolution of university-industry cooperation is traced through three stages—moving from associations to close integrations—demonstrating a tailored framework that fosters sustainable economic growth and innovation. By examining the interplay of educational technology, interdisciplinary collaboration, and government support, the paper outlines the pathways through which collaborative innovation can generate synergistic outcomes, ultimately contributing to the development of a robust innovation ecosystem. The findings underscore the necessity for continued cooperation among stakeholders to enhance the effectiveness of university-industry partnerships in addressing contemporary challenges and promoting global competitiveness.

Keywords: University-Industry Cooperation, Higher Education, Synergistic Effects

Introduction

This study focuses on the issue of international higher education (IHE) in Hainan and discusses how to construct innovative strategies for the IHE in the context of the construction of Hainan Free Trade Port. Generally speaking, as an inevitable outcome of economic.

In contemporary Chinese society, children growing up in different family environments face the so-called “the cross road of fate”, that is, the inequality of opportunity in the family's investment in human capital. On the one hand, urban middle-class families are keen to invest in their children's education. On the other hand, some children face a lack of parental care and some families who have just gotten out from poverty may not yet realize the importance of investing in their children. Parents at higher socioeconomic levels are more likely to take steps to promote their children's human capital and other measures that will help them succeed in the future. The "parenting gap" can arise when disadvantaged families are unable to maximize their

children's potential due to various resource constraints, including the lack of time or money, or parenting knowledge. This gap in parenting may persist in contemporary society and become a potential threat to relative social mobility.

On the one hand, underdeveloped human capital of disadvantaged groups caused by family cultivation differences is a waste of resources. In the long-term, it will affect both the socioeconomic achievement of individuals and constrains the quality development of the economy. China is in a period of transition, and with deepening aging, there may be a shortage of a large, middle-aged and skilled workforce in the future. The country needs a strong and productive workforce that can compete successfully in the global economy to achieve high quality economic development, which relies on technological progress and innovation.

On the other hand, as China builds a moderately prosperous society and wins the battle against poverty by 2020, how to interrupt the intergenerational transfer of poverty, efficiently develop and promote all-round human development, and build a long-term mechanism to overcome relative poverty is one of the most important issues that the government and society urgently need to address. An important philosophical and practical question is whether government and society should play a role in alleviating the plight of disadvantaged children who are unable to reach their potential, not only because their parents lack the economic conditions, but also because their parents lack the ability, mental health, or knowledge to help them maximize their success (Swift, 2005). This calls for a deeper exploration of what parenting deficits in the family hinder the formation and development of a child's human capital.

Objective

There are four research objectives in this study, as outlined below:

1) Constructing the theoretical framework of collaborative innovation within university-industry cooperative organizations.

2) Analyzing the relationship between the parties involved in university-industry cooperation through the lens of collaborative innovation and outlining the organizational mechanisms involved.

3) Investigating the specific collaborative processes of innovation components within university-industry cooperation.

4) Examining the pathways through which collaborative innovation is achieved in university-industry cooperation organizations.

Research Scope

The research population scope

1. Population

The sample for this study included approximately 10,000 students in grades 7 and 9 from more than 250 classes in over 60 schools in mainland China.

2. Sampling

China Educational Panel Survey (CEPS) is a large-scale tracking survey designed and implemented by the China Survey and Data Center of Renmin University of China. 112 schools, 438 classes, and 20,000 students were randomly selected nationwide as the survey sample, including students, parents, teachers, and school leaders. CEPS is the most comprehensive microsampling database on school education, parent-child interactions, teacher-student interactions, and peer relationships in China.The current publicly available data is based on the 2015-2017 school year as a baseline, surveying two middle school cohorts: first-year middle school students (grade 7) and third-year middle school students

(grade 9). This data provides data support to explore the direct and peer effects of the family nurturing model. This study intends to screen out schools that do not strictly adhere to the random assignment rules for student enrollment.

3. **The research area scope**

   The scope of this study was in mainland China.

4. **The research contents scope**

   Independent Variable

   Variable A: Whether the individual student has received pre-school education.

   Variable B: Percentage of students in the class who have received preschool education.

   Variable C: Whether individual students are in parent-child separation status.

   Variable D: Percentage of students with parent-child separation in the classroom.

   Variable E: Parenting style.

   Dependent Variable

   Variable F: Students' cognitive and non-cognitive skills.

5. **The research period scope**

   2022.10-2023.10

Methodoloty

1. **Research Paradigm**

Given the nature of these research objectives, this study employs a mixed-method approach that integrates quantitative analysis with qualitative methodologies. The first and second objectives aim to uncover explanatory insights rooted in social phenomena, thus warranting a qualitative research approach. Conversely, the third and fourth objectives seek to propose hypotheses based on established models, validate them, and identify overarching principles applicable in practical settings, making a quantitative research methodology more suitable. This research seeks to corroborate, reinforce, or challenge existing findings across diverse research contexts, drawing on an extensive body of literature, established variables, and contemporary theories to inform its investigations. Therefore, a quantitative paradigm is deemed essential for this study.

2. **Research Design**

Built upon a robust review of literature, established variables, and contemporary theories, the research design is informed by prior knowledge in the field. Contextualizing existing research within the study's framework enables the synthesis of diverse perspectives, supports or challenges previous conclusions, and contributes to the advancement of knowledge in the domain of university-industry collaboration and collaborative innovation.

This study will adopt a mixed-method research design that combines both quantitative and qualitative approaches to address the four research objectives outlined.

The integration of quantitative and qualitative data will provide a comprehensive understanding of collaborative innovation in university-industry cooperative organizations. Triangulation of findings from both approaches will help validate and enrich the research outcomes, allowing for a deeper exploration of the research objectives. Additionally, existing research findings will be contextualized within the study's framework to support or challenge previous conclusions and contribute to the advancement of knowledge in this field.

3. **Research approach**

This study employs a mixed-method research approach that combines quantitative and qualitative methodologies to comprehensively investigate collaborative innovation within university-industry cooperative organizations. The integration of both quantitative and

qualitative data allows for a multifaceted exploration of the research objectives and offers a more nuanced understanding of the complex dynamics at play in such collaborative settings.

The quantitative component of the research methodology focuses on hypothesis testing, validation, and the identification of general principles related to collaborative innovation. Utilizing surveys and statistical analysis, this approach enables the examination of specific collaboration processes and pathways leading to innovation within university-industry partnerships. By testing hypotheses derived from established models and theoretical frameworks, the quantitative analysis contributes pivotal insights for understanding collaborative innovation dynamics. The study utilizes a well-established and validated questionnaire survey, endorsed by previous scholars for its reliability and validity, to collect data on the research variables. To assess and analyze variables for hypothesis testing, choices need to be made about the sampling approach, data collection methods, and data processing methods. Survey questions were developed using a Likert five-point scale and distributed to the appropriate demographic through an online platform. Statistical analysis software tools such as SPSS and Smart PLS are employed to assess the gathered data and test the assumptions derived from the proposed conceptual framework.

4. Research setting

This study examines collaborative innovation in the context of university-industry partnerships in China, with a particular focus on talent development. The survey was carried out in 5 universities affiliated with the Ministry of Education and 5 provincial universities, targeting managers or administrative staff of university-industry cooperation entities, as well as teachers and students.

5. Sampling methodology

After determining the research methodology, the next step involves selecting the target audience, sampling strategy, and sample. The target audience, also known as the model's field of application, refers to how the model will be utilized. Following the identification of the target population, it is crucial to choose an appropriate sampling strategy and sample for the study.

In this study, managers or administrative staff of university-industry cooperation entities, as well as teachers and students in 5 universities affiliated with the Ministry of Education and 5 provincial universities will be selected as research group.

According to the guidelines of Structural Equation Modeling (SEM), the sample size should ideally be 20 times the number of observable variables, which in this study is 14, resulting in a recommended minimum sample size of 280. However, considering empirical data and available resources, the research aims for a sample size of 420.

For the qualitative aspect, 15 interviewees have been chosen using purposive and convenience sampling methods, with interviews scheduled between January and June 2024.

The specific sampling criteria that are used will depend on the particular research project. It is important to carefully consider the criteria before collecting data. Therefore, the representativeness of samples is the core requirement of sampling and data collection. Combining with the theme of this study, the sample used by the author is randomly selected from 10 universities in Hainan and Guangdong Province, 5 universities affiliated with the Ministry of Education and 5 provincial universities, including 220 participants from Hainan Universities, 200 participants from Guangdong Universities, to ensure a diverse representation of the population under study.

In this study, a random sampling technique is employed to guarantee a representative sample. In this technique, every individual in the population has an equal chance of being selected. This method helps in reducing bias and allows for generalizability of the results to the larger population. Justification: Random sampling ensures that each

member of the population has an equal opportunity to be included in the study, leading to a representative sample.

Conclusion and Discussion

1. Conclusion

The study on the collaborative innovation of university-industry cooperation highlights the critical role these partnerships play in driving educational reform and enhancing technological advancement. The evolving landscape of higher education necessitates a strategic alignment between academic institutions and industry leaders to address the challenges of modern economies effectively. Through a synergistic approach, universities can contribute to the innovation pipeline, while industries benefit from cutting-edge research and a skilled workforce.

Key findings demonstrate that effective collaboration can lead to improved talent development outcomes, with graduates better equipped to meet the needs of the workforce. Government support remains essential in fostering these partnerships, as targeted policies and initiatives encourage sustainable collaboration. Furthermore, advancements in digital technology and globalization present new opportunities for innovative cooperation, allowing for expanded networks that transcend geographical barriers.

Ultimately, the findings of this study underscore the importance of a cohesive strategy that integrates education, research, and industry application. By actively promoting interdisciplinary learning, utilizing digital tools, and establishing robust frameworks for collaboration, stakeholders can create a dynamic ecosystem that not only enhances educational practices but also drives economic growth and global competitiveness. The path forward lies in nurturing these partnerships, ensuring that university-industry cooperation continues to evolve in a manner that is mutually beneficial and aligned with the demands of an ever-changing world.

2. Discussion

The study indicates that university-industry cooperation has evolved from traditional partnerships to comprehensive collaborations characterized by shared resources, joint research projects, and co-developed educational programs. This transition reflects a deeper integration of academic knowledge with industry practices.

It was found that governmental policies providing financial support, tax incentives, and intellectual property protections play a crucial role in fostering collaborative innovation. These measures create a conducive environment for partnerships between universities and enterprises.

Collaborative projects have led to the development of innovative talent models that align educational outcomes with market needs. Students are equipped with practical skills and experiences that enhance their employability and competitiveness in the workforce.

The research highlights that advancements in digital technology enable remote collaborations and facilitate increased international partnerships, fostering global exchange of knowledge and innovation.

By implementing the following suggestions, the synergistic effects of collaborative innovation between universities and industries can be maximized, leading to sustainable economic growth and continuous advancements in education and research.

Strengthening Collaborative Frameworks: Universities and industries should continue to build on existing partnerships by establishing dedicated research institutes or innovation hubs that promote ongoing collaboration. This will enhance the depth of

cooperation and facilitate technology transfer.

Government Policy Enhancement: Policymakers should consider expanding existing support mechanisms to incentivize long-term collaborative efforts, including funding for joint research initiatives and programs that promote entrepreneurial skills among students.

Focus on Interdisciplinary Learning: Institutions should encourage interdisciplinary programs that allow students to engage with diverse fields, fostering a holistic understanding of complex industry challenges and enhancing their problem-solving capabilities.

Adopting Digital Tools: Institutions and enterprises should leverage digital tools and platforms to facilitate remote cooperation and virtual laboratories, expanding opportunities for collaboration beyond geographical limitations.

Continuous Monitoring and Adaptation: Stakeholders should engage in continuous evaluation of collaborative practices to identify best practices and areas for improvement. This adaptive approach will ensure that university-industry cooperation remains relevant in the face of changing technological and market landscapes.

Promoting Global Cooperation: Encouragement of international partnerships between universities and multinational companies should be emphasized, facilitating knowledge exchange and joint research initiatives that address global challenges.

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