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Industry-University-Research Collaboration in Gansu Province: Addressing Challenges and Leveraging Opportunities

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Abstract

The importance of fostering strong Industry-University-Research (IUR) collaboration is increasingly recognized as a critical driver of regional innovation, economic development, and talent cultivation. This study focuses on the underdeveloped Gansu Province, where IUR collaboration faces both significant challenges and unique opportunities. The need to examine IUR collaboration in Gansu is particularly pressing due to its potential to bridge gaps between academic research, industry demands, and government policy, thereby improving the region's economic competitiveness and innovation capacity. Through semi-structured interviews with stakeholders from universities, enterprises, and government departments, this research systematically explores the key challenges and opportunities within Gansu's IUR collaboration landscape, utilizing NVivo software for content analysis. The study finds that major challenges include: a lack of diverse collaboration models, over-reliance on personal connections for partnerships, bottlenecks in commercializing research, and limited access to innovation resources. These factors hinder the formation of stable, long-term partnerships. Conversely, the study identifies government policies and talent development initiatives as significant opportunities to enhance IUR collaboration. Moreover, the localization of technological projects can align innovation with regional needs, improving project feasibility and competitiveness. By examining these challenges and opportunities, this study contributes valuable insights into refining collaboration mechanisms in Gansu and similar underdeveloped regions. It provides practical recommendations for policymakers, universities, and enterprises on how to optimize collaboration, foster innovation, and drive regional development through effective IUR partnerships.

Keywords: Gansu Province, Industry-University-Research Collaboration, Challenges And Opportunities, Qualitative Research

Introduction

Globally, technological innovation has become a crucial means for countries to promote economic growth and enhance international competitiveness. Especially with the advent of a new wave of technological revolution and industrial transformation, emerging technologies such as artificial intelligence, big data, and the Internet of Things are rapidly permeating various industrial fields, driving profound adjustments and upgrades in global industrial structures. Against this backdrop, developed countries are accelerating the promotion of Industry-University-Research (IUR) collaboration through policy guidance and resource allocation to rapidly transform scientific and technological achievements into market applications (Liu, 2002). Silicon Valley in the United States, the Cambridge Science Park in the United Kingdom, and the National Institute of Advanced Industrial Science and Technology in Japan are all exemplary cases of successful IUR collaboration. These regions have fostered tight cooperation between IUR entities, which not only promoted technological advancement but also established regional innovation hubs that have spurred economic prosperity. In comparison to developed countries, China still encountered a series of challenges, particularly in the less-developed regions of the western part of the country, where implementing IUR collaboration encounters more challenges.

Gansu Province, as a key node in the "Belt and Road" Initiative, faces unique development opportunities but also a series of challenges. First, due to its remote geographical location and weak industrial foundation, Gansu's economic development is still constrained. Issues such as lack of policy coordination, uneven resource allocation, and lagging innovation capacity are urgent problems to be addressed. Second, although Gansu's research foundation is relatively weak, it also holds great potential. The province is home to national key laboratories and national-level industrial technology innovation platforms, with strengths in disciplines and technology fields such as ecological security and sustainable development, drought-resistant and high-efficiency crop production in arid regions, ecological restoration, cultural relic protection, and solid lubrication (Gansu Province's 14th Five Year Plan for Science and Technology Innovation, 2021). After decades of development, the IUR situation in Gansu has greatly improved. In 2020, there were 857 enterprises engaged in innovation cooperation, accounting for 15.9% of all enterprises in the province. Among these innovative enterprises, 269 had partnerships with universities, accounting for 31.4% of all innovation-cooperating enterprises, and 209 had partnerships with research institutions, accounting for 24.4% (Department of Statistics of Social Science, 2021). This indicates that a significant proportion of enterprises in Gansu engaging in innovation cooperation are involved in IUR collaborative innovation. However, despite having some key universities and research institutions, overall investment in research remains insufficient, and the technological innovation capacity of enterprises is relatively limited.

In recent years, the Chinese government has placed great emphasis on the role of technological innovation in regional economic development and has proposed a series of policies and measures to promote IUR collaboration. In 2021, the Fourth Session of the 13th National People's Congress passed the resolution on the 14th Five-Year Plan for National Economic and Social Development and the Long-Range Objectives Through the Year 2035 (referred to as the "14th Five-Year Plan"), which underscores the need to uphold innovation-driven development and comprehensively shape new advantages in development. This suggests that China will continue to adhere to the direction of innovation-driven development

for a long time to come. In response to national policies, Gansu Province has also issued multiple policy documents to promote technological innovation and IUR collaboration, aiming to strengthen cooperation among IUR entities to drive the economic transformation and upgrading of the province. Against this backdrop, the Gansu Provincial 14th Five-Year Plan for National Economic and Social Development and Long-Range Objectives for 2035 explicitly identifies innovation as the primary driving force for development, accelerating the construction of an innovative province and positioning Gansu as a new innovation-driven development hub in western China. These policies not only increase the enthusiasm for collaboration between local enterprises and research institutions but also attract external resources and advanced technologies, injecting new vitality into Gansu's economic development.

This study aims to deeply analyze the challenges and opportunities in IUR collaboration in Gansu Province, identifying the key factors affecting the effectiveness of cooperation. This is of significant theoretical and practical value for promoting the development of the regional innovation system in Gansu and enhancing the collaborative innovation capacity of universities, research institutions, and enterprises. Against the backdrop of the Belt and Road Initiative and national policy support, this research explores how Gansu’s experience and challenges can inform the use of IUR cooperation mechanisms to drive regional economic transformation, highlighting the necessity of this study.

Thus, this study, through qualitative research methods and based on interview data from 13 participants, conducts an in-depth analysis of Gansu Province's actual performance in IUR collaboration. The study aims to reveal the challenges and opportunities faced by Gansu's IUR collaboration, providing decision-making references for local governments, universities, research institutions, and enterprises.

Literature Review

In the context of globalization, IUR collaboration has become a key strategy for promoting technological innovation and regional economic development. Enterprises, universities, and research institutions are the main entities of IUR. Generally, IUR refers to the strategic cooperation between enterprises, universities, and research institutions, and it can be categorized into broad and narrow definitions. The broad definition of IUR encompasses cooperation that integrates talent cultivation, technology research and development, and commercialization, covering various stages of technological development. The narrow definition of IUR refers to the cooperation between enterprises, universities, and research institutions with the purpose of technological innovation and commercialization, where both parties, based on the principles of equality and mutual benefit, become partners in technological innovation (Cai, 2010).

Governments, enterprises, universities, and research institutions in different countries and regions have adopted various forms of cooperation models to promote the deep integration of technology and industry, facilitating the commercialization of scientific research achievements and driving regional economic development. These cooperation models are particularly prominent in developed countries such as the United States, the United Kingdom, Japan, and South Korea. As a global leader in technological innovation, the IUR collaboration model in the United States has had a significant global impact. The

collaboration between universities and enterprises in the U.S. has a history of over a century, with the "Silicon Valley Model" being the most representative. This model is built on the close cooperation between Stanford University and surrounding enterprises, forming a globally renowned hub for technological innovation and entrepreneurship (Li, 2015). The success of Silicon Valley is not only attributed to abundant technological resources and a culture of entrepreneurship but also to strong government support, such as the establishment of federal research funding programs and legislation promoting the commercialization of technological achievements, which have driven the deep integration of technology and industry. Additionally, the U.S. has fostered the commercialization of scientific research outcomes and the development of emerging industries through various models such as business incubators, research parks, and cooperative research centers (Xu et al., 2014).

The United Kingdom has also accumulated rich experience in IUR collaboration, with its primary models including the Cambridge Science Park and the Warwick Model. The Cambridge Science Park, one of the earliest science parks in the UK, has attracted numerous high-tech enterprises and research institutions, forming an innovation-centered ecosystem. This model successfully transformed university research into industrial applications, driving regional economic development. The Warwick Model, on the other hand, promotes the commercialization of scientific research achievements through deep cooperation between universities and enterprises, especially in the manufacturing sector, providing strong support for the UK's economic transformation.

Japan’s IUR collaboration model is characterized by strong government leadership. Japan promotes cooperation between universities and enterprises through various means such as establishing joint research centers, commissioning research mechanisms, and corporate donation systems (Li, 2004). The Japanese government also encourages joint technological research and the sharing of scientific research results between enterprises, universities, and research institutions by establishing science parks and special funds for IUR collaboration. These measures have significantly promoted the integration of technology and industry in Japan, enabling the country to maintain a strong international competitiveness in high-tech fields.

Similarly, South Korea’s IUR collaboration model demonstrates a high degree of government leadership. South Korea has established joint IUR foundations to provide sufficient funding and management services to promote joint research driven by the needs of enterprises (Fei et al., 2014). South Korean universities and research institutions work closely with enterprises to jointly develop new technologies and commercialize scientific research outcomes. This model not only enhances the innovation capabilities of enterprises but also boosts the country's overall technological level.

In the IUR collaborative innovation process, universities typically facilitate knowledge transfer and play a key role in collaboration, knowledge transfer, and product innovation (Ciliberti et al., 2016), while companies assume more of the management roles (Goel et al., 2017). Nevertheless, some scholars remain cautious about IUR collaboration. For example, Grant (2001) argues that IUR collaboration may interfere with the core functions of universities and research institutions (Tao, 2019). Crespo and Dridi (2007) also suggest that IUR collaboration tends to be more economically driven, focusing on applied research, which

may hinder universities and research institutions from conducting forward-looking, strategic basic research. The success stories from various countries and regions indicate that selecting the appropriate cooperation model based on local conditions is key to achieving technological innovation and regional economic development (Lan, 2014b).

Gansu Province must fully consider its geographical location, economic structure, and industrial characteristics while drawing on the successful experiences of developed countries, in order to explore an IUR collaboration model suitable for the local context. From mid-June to early July 2021, a special research group formed by the Standing Committee of the Gansu Provincial People's Congress conducted field research on 31 enterprises in five cities, including Lanzhou, Jiayuguan, Zhangye, Jinchang, and Tianshui. Additionally, the Standing Committees of the People's Congresses in Dingxi and Pingliang were commissioned to conduct studies within their jurisdictions. Reports from several departments, including the Provincial Department of Science and Technology, the Provincial Department of Industry and Information Technology, the Provincial State-owned Assets Supervision and Administration Commission, and the Provincial Department of Finance, were also reviewed. The research results showed that Gansu currently suffers from low investment intensity in research and development. The province has a weak presence in the technological innovation chain and limited influence. The research outcomes from IUR collaborative innovation are disconnected from market needs and fail to meet the technological innovation demands of enterprises. Additionally, there is a noticeable trend of innovation talent outflow. This suggests that Gansu faces a scarcity of resources in terms of financial, human, and knowledge resources, and the primary challenge in promoting IUR collaboration is the insufficient allocation of resources. Moreover, the lack of depth in cooperation between enterprises and universities is also a key factor limiting IUR collaboration. Most enterprises in Gansu are small and medium-sized, with limited R&D investment and innovation capabilities, making it difficult for them to engage in deep cooperation with universities and research institutions. In addition, the relatively weak research capabilities of local universities further hinder the effectiveness of IUR collaboration (Lan, 2014a). This lack of depth in collaboration not only affects the efficiency of research commercialization but also limits the region's economic development potential.

In summary, Gansu Province faces unique challenges and opportunities in advancing IUR collaboration. By learning from successful domestic and international experiences, Gansu should explore more cooperation models suited to local conditions to respond to the evolving trends in global technological innovation and the needs of regional economic development.

Research Methodology

The primary data collection for this study was focused on universities, enterprises, and government agencies within Gansu Province. To ensure that the interviewees had a deep understanding of the functioning of the IUR collaborative innovation mechanism, we carefully selected the participants. A total of 13 participants were interviewed through semi-structured interviews, including six university professors, three enterprise managers, two staff members from government and university science and technology management departments, and two individuals responsible for university innovation and entrepreneurship. The university professors were from institutions in Gansu Province that are at a high level in IUR collaborative innovation, while the enterprises interviewed included well-known independent enterprises and university spin-offs in Gansu. The respondents from science and

technology departments included staff from both government and relevant university departments, and heads of university innovation and entrepreneurship management departments were also interviewed.

During the data collection phase, semi-structured interviews were primarily used. Semi-structured interviews not only allowed researchers to deeply explore the pre-established research questions but also provided the flexibility to adjust the direction of the interviews to capture the unique insights and experiences of the interviewees. The interview questions centered around several key themes: experiences and understanding of collaborative innovation, factors influencing collaborative innovation, challenges and barriers in collaborative innovation, and suggestions for enhancing collaborative innovation capabilities. Each interview lasted between 60 and 90 minutes, and all interviews were recorded and transcribed verbatim to ensure the accuracy and completeness of the data. Throughout the interview process, the researchers maintained a neutral stance, encouraging interviewees to fully express their personal views to gain in-depth insights.

In addition to primary data, this study also utilized secondary data. The secondary sources were twofold: the first type included various written materials provided by the interviewees, while the second type consisted of documents and information related to IUR collaborative innovation obtained from the official websites of provincial government agencies, relevant universities, research institutions, and enterprises.

For data analysis, this study employed content analysis. The researchers first read, organized, and cleaned the interview data repeatedly to ensure its completeness and accuracy. Then, the interview transcripts were imported into NVivo software for coding, with keywords related to IUR collaboration extracted and used as third-level nodes. These third-level nodes were then categorized and integrated into second-level nodes. Finally, based on the research themes, the second-level nodes were further summarized into first-level nodes, thereby constructing a systematic coding framework. Through this coding process, the researchers were able to clearly identify the challenges and opportunities in IUR collaboration and analyze the key issues and facilitating factors at different levels of the collaboration.

Research Findings and Discussion

Major Challenges

(a) Limitations of Collaboration Forms and Models

As an important mechanism for promoting regional innovation and economic development, IUR collaboration has received widespread attention in recent years. However, in Gansu Province, the forms and models of IUR collaboration present certain limitations, which to some extent weaken the breadth and depth of collaboration, thereby hindering the overall improvement of innovation capacity.

First, IUR collaboration in Gansu Province heavily relies on personal connections among university professors. The advantage of this model is that it allows for the rapid establishment of collaborative relationships and facilitates the implementation of short-term projects. However, over-reliance on personal connections also brings significant limitations. Such collaboration models often lack stability and continuity, making it difficult to form long-term partnerships. Additionally, collaborations driven by personal connections are susceptible to

disruptions caused by personnel mobility, individual interests, and changes in the external environment, which challenge the sustainability of such collaborations.

Second, the ability to innovate in collaboration forms is limited in Gansu Province, where most collaborations remain within the traditional models of technology transfer and contract research. Although these models can promote technology transfer and the application of research outcomes to some extent, they lack sufficient depth and breadth. For example, technology transfer typically involves a single technology or product, while contract research is often confined to specific projects and timeframes, making it difficult to achieve sustained innovation and knowledge accumulation. This traditional model of collaboration lacks the flexibility to respond to market demands, particularly in the context of rapidly changing market environments, making it challenging to meet the diverse needs of enterprises for innovation and development.

The existing collaboration models in Gansu Province have not fully harnessed the potential of IUR collaboration. There is a lack of systematic cooperation mechanisms between the main collaboration entities, leading to dispersed resources and repeated investments, which ultimately hinder the enhancement of overall innovation capacity.

(b) Bottlenecks in Marketization of Research Outcomes

The marketization of research outcomes is a core aspect of IUR collaboration, as it determines whether research achievements can be successfully transformed into actual market products, thereby driving economic growth and technological advancement. However, in Gansu Province, the marketization of research outcomes faces numerous challenges and bottlenecks. These not only limit the effectiveness of IUR collaboration but also hinder the overall development of the regional innovation system.

First, the conflict of objectives between universities and enterprises is one of the major barriers to the marketization of research outcomes. Universities, as the primary bases for knowledge production, often focus on academic and theoretical research. While these research outcomes may have high theoretical value in academia, they often lack immediate market relevance. University research is typically driven by the need for academic exploration and discipline development, with little consideration given to the applicability of research outcomes. On the other hand, enterprises are more concerned with the market application of research outcomes, seeking to enhance their product competitiveness and market share through technological innovation. This disparity in objectives makes it difficult for university research outcomes to directly meet the needs of enterprises in the marketization stage, leading to inefficient collaboration.

Second, there is a lack of sufficient support and incentive mechanisms for university researchers to engage in marketization, which is another key reason for the inefficiency of marketization in Gansu Province. In the traditional university research system, researchers are primarily evaluated based on the quantity and quality of academic outputs, such as published papers and obtained patents, while there is a lack of corresponding incentive mechanisms for the marketization of research outcomes. As a result, researchers tend to prioritize academic achievements over the practical application and market relevance of their research. Additionally, the technology transfer mechanisms within universities are not well-

developed and lack effective market orientation. These institutional shortcomings make it difficult for university researchers to access timely market demand information, preventing them from adjusting their research directions quickly to adapt to market changes, ultimately leading to challenges in the marketization of research outcomes.

This phenomenon is particularly pronounced in Gansu Province. As a relatively underdeveloped region, Gansu faces not only the aforementioned challenges of conflicting objectives and institutional deficiencies in marketization but also structural issues such as resource scarcity and talent loss. First, Gansu's weak economic foundation means that high-level innovation talent and advanced research and development facilities are relatively scarce. Even when some research outcomes show market potential, they often struggle to be effectively commercialized and industrialized due to a lack of sufficient resource support and talent reserves. Furthermore, the limited capacity for technological innovation and market expansion among enterprises in Gansu also contributes to the unclear pathways for marketization of research outcomes. As the primary demand side for technological innovation, the technological capabilities and innovation capacity of enterprises directly influence the efficiency of research outcome marketization. However, many enterprises in Gansu face significant challenges in innovation. On the one hand, limited investment in research and development leads to insufficient technological reserves and innovation capacity; on the other hand, enterprises also lack the experience and capabilities to effectively bring research outcomes to market. These issues result in low efficiency in the marketization of research outcomes, with many innovations ultimately failing to secure a place in the market, further weakening the competitiveness of enterprises and the vitality of the regional economy.

(c) Barriers to Innovation Resources and Their Utilization

The acquisition and utilization of innovation resources are critical pillars for promoting IUR collaboration. However, in Gansu Province, the scarcity and outflow of innovation resources significantly limit the level of IUR collaboration, further exacerbating the region's lack of innovation capacity. The absence of innovation resources is not only reflected in the lack of physical infrastructure but also in the insufficiency of soft resources such as talent, technology, and funding, which poses severe challenges for innovation-driven development in Gansu.

First, as an underdeveloped region, Gansu’s research conditions and market environment are relatively weak, directly contributing to the outflow of local innovation resources. This outflow includes not only high-level research talent and technology but also innovation projects and capital. The loss of high-end talent is particularly pronounced, as many well-educated professionals and researchers opt to seek better career opportunities in more economically developed regions due to the lack of effective mechanisms to attract and retain talent. This phenomenon weakens the research foundation of Gansu, making local innovation resources even scarcer and further limiting the sustainable development of IUR collaboration.

Second, the incomplete mechanisms for sharing innovation resources are another major reason for the low utilization of such resources. Resource sharing is an essential means of maximizing the utilization of innovation resources; however, in Gansu, the development of

such mechanisms remains inadequate. Collaboration between universities and enterprises often lacks systematic mechanisms for resource integration, leading to underutilization of research equipment, experimental facilities, and technological platforms. For example, many universities possess advanced experimental equipment and abundant research resources, but due to a lack of effective connection with enterprises, these resources remain underutilized or even idle. On the other hand, enterprises, lacking advanced research facilities and technical support, find it difficult to conduct effective technological innovation. This waste of resources and redundant investments not only reduces innovation efficiency but also weakens overall innovation capacity.

(d) Weak Collaborative Relationships

Strong collaborative relationships are key to ensuring the smooth progress of IUR collaboration. However, in Gansu Province, the weak collaborative relationships between enterprises and universities have become one of the main challenges in the collaboration process. These weak relationships not only hinder the deepening of collaboration but also increase its complexity and uncertainty, ultimately affecting the overall effectiveness of IUR collaboration.

First, the lack of a clear risk-sharing mechanism further exacerbates weak collaborative relationships. Innovation projects in IUR collaboration typically involve significant technical and market risks, and how to allocate and bear these risks is a core issue that both parties must address. In Gansu Province, due to the absence of a clear risk-sharing mechanism, the parties involved often choose to act unilaterally when facing project failure or market fluctuations, lacking the willingness to address issues jointly. This fragmented approach not only weakens the coordination between the parties but also increases the risk of collaboration failure.

Second, poor communication is another important factor contributing to weak collaborative relationships. In the collaboration between universities and enterprises, cultural differences and communication barriers often lead to information asymmetry and misunderstandings. The absence of regular meetings to enhance communication further aggravates this issue. This asymmetry in information exchange often prevents both parties from forming a common understanding and shared expectations, thereby further weakening the stability of the collaborative relationship.

Potential Opportunities

(a) Policy Support and Government Participation

Policy support and government participation are critical guarantees for promoting IUR collaboration. Although many IUR projects still face challenges such as funding shortages in practice, the Gansu Provincial Government has introduced a series of policies supporting IUR collaboration, providing universities and enterprises with support in terms of funding, technology, and talent. This has not only facilitated the initiation and implementation of collaborative projects but also laid a solid foundation for the long-term sustainability of these collaborations.

First, the Gansu Provincial Government provides direct support to university-enterprise collaborations through fiscal allocations, tax incentives, and special funds. The injection of

these funds has allowed many innovative projects, which had previously stalled due to a lack of funding, to get off the ground. This support is particularly critical for small and medium-sized enterprises, which often face significant market competition and lack sufficient independent research and development funds. Government financial support has helped these enterprises make breakthrough progress in technological innovation and research and development capabilities.

Second, in addition to policy support, the government actively promotes coordination and collaboration between universities and enterprises. In Gansu Province, government-led IUR projects have become one of the key forms of collaboration. The government not only provides funding for these projects but also establishes cooperation frameworks and regulations to ensure smooth project execution. For example, the government has introduced specific measures for intellectual property protection, technology transfer, and the commercialization of results, safeguarding the legal rights of both parties and reducing potential disputes over interests during the collaboration process, thereby improving collaboration efficiency and the success rate of result commercialization.

However, despite the strong guarantees provided by policy support and government involvement, there are new challenges. While the government offers robust support, IUR projects still face difficulties related to funding and policy implementation during practical operations, which could impact the long-term sustainability of these collaborations. Additionally, during policy formulation and implementation, the government's insufficient grasp of market needs may lead to some policies being poorly executed, or their incentive effects may not be fully realized.

(b) Talent Cultivation and Development

Talent cultivation is an indispensable part of IUR collaboration. Through IUR collaboration, universities not only provide enterprises with a large pool of highly qualified talent but also enhance students' practical and innovative abilities, offering important talent support for local economic development.

First, the integration of practice with theory is a distinctive feature of talent cultivation in Gansu Province. Through IUR collaboration, universities involve students directly in real-world projects, enabling them to apply the theoretical knowledge learned in the classroom to practice. For example, in legal collaborations, students can gain valuable legal practice experience by participating in local legislative projects. This teaching model, combining practice and theory, not only equips students with solid professional skills but also helps them better understand and address complex issues in the workplace.

Second, universities in Gansu Province have gradually established a market-oriented talent cultivation model through collaboration with enterprises. This model emphasizes the close connection between university education and actual market demand, ensuring that graduates can quickly adapt to market changes and meet the needs of enterprises. In this collaborative model, students are exposed to the latest industry trends and technological developments at an early stage, while also gaining insights into enterprise operations and management practices through internships and project participation. These experiences lay a solid foundation for their future careers and enhance their employability.

However, Gansu Province faces several challenges in talent cultivation. One of the main challenges is the severe outflow of talent. Despite the large number of talented individuals cultivated through university-enterprise collaboration, many graduates choose to leave Gansu after completing their studies to seek better opportunities in more economically developed regions. This talent loss not only weakens local enterprises' innovation capacity but also negatively impacts the sustainable development of the regional economy.

(c) Localization and Implementation

Localization and implementation are crucial to ensuring the practical success of IUR collaboration. In this regard, Gansu Province has demonstrated a strong adaptability by adjusting and optimizing projects based on local realities, which has led to the successful implementation of many collaborative projects and injected new vitality into the local economy.

First, during the localization process of IUR collaboration projects, Gansu Province has fully considered regional characteristics and economic development needs. For instance, some engineering projects have incorporated local technologies and experiences into their design and implementation, taking into account Gansu's unique geographical and climatic conditions. This localization of technological adaptation not only improves project adaptability but also effectively avoids the problems that could arise when applying external technologies locally. For example, in the agricultural sector, Gansu has collaborated with universities to introduce and improve crop varieties suitable for the local climate, thereby enhancing agricultural productivity and boosting the local agricultural economy.

Second, the collaborative projects in Gansu have shown strong operability during implementation. Through close cooperation with local governments, these projects have not only received policy and financial support during implementation but have also been better aligned with local market demands. For example, in high-tech industry collaborations, the Gansu Provincial Government has provided special funding for implemented projects and encouraged local enterprises to participate in the projects through policy guidance, thereby increasing the success rate and market adaptability of these projects.

However, the challenges in localization and implementation should not be overlooked. Due to the relatively weak economic foundation of Gansu Province, some projects still face difficulties related to funding, technology, and talent during the implementation process. This is particularly evident in high-tech fields, where the lack of local technological reserves and talent resources makes it difficult for some projects to maintain long-term development after implementation. This situation not only affects the sustainability of the projects but also limits the depth and breadth of collaboration.

Conclusion

Key Research Findings

This study conducted a systematic analysis of the IUR collaboration mechanism in Gansu Province, revealing multiple challenges and opportunities, and summarized the following key findings:

First, the IUR collaboration model in Gansu Province is relatively simplistic, particularly in its over-reliance on personal connections of university professors. While this model can facilitate the rapid initiation of projects in the short term, it lacks long-term sustainability and institutional guarantees, resulting in unstable collaboration relationships and insufficient continuous innovation momentum. The forms of collaboration are traditional, focusing on technology transfer and contract research, which are unable to meet the diverse needs of the current market and hinder long-term development for enterprises. In particular, when faced with dynamic market changes, the existing model lacks flexibility and struggles to drive deep innovation.

Second, the marketization of research outcomes is a critical stage of IUR collaboration; however, Gansu faces significant bottlenecks in this regard. There are notable differences between the objectives of universities and enterprises, making it difficult for research outcomes to align with market demands. Universities tend to focus on the theoretical value of academic achievements, while enterprises are more concerned with market applications. This disconnect in collaboration goals and directions for commercialization results in inefficiency. Additionally, the lack of a comprehensive incentive mechanism diminishes the motivation of university researchers to commercialize their outcomes, leading to low efficiency in technology transfer. Moreover, issues such as funding shortages and brain drain exacerbate the difficulties in marketizing research outcomes. As an underdeveloped region, Gansu's enterprises have limited technological innovation and market expansion capabilities, making it challenging to transform research outcomes into commercial value.

Third, significant barriers exist in the acquisition and utilization of innovation resources. Gansu Province suffers from a serious outflow of innovation resources, particularly high-level talent and innovation projects migrating to more developed regions, weakening the local innovation foundation. The absence of resource-sharing mechanisms also hampers the efficiency of collaboration between universities and enterprises. Although universities possess advanced research equipment and resources, they often remain underutilized due to a lack of effective connection with enterprises. Furthermore, insufficient funding and inadequate policy implementation hinder the effective integration of innovation resources, limiting the enhancement of regional innovation capacity.

Despite these challenges, IUR collaboration in Gansu Province also presents unique opportunities. First, government policy support has played a crucial role in driving collaboration. Through measures such as fiscal allocations and tax incentives, the government provides solid financial and technical backing for collaboration projects, which is especially important for small and medium-sized enterprises. Second, universities in Gansu have successfully combined theory with practice through IUR collaboration in talent cultivation, producing a large number of highly qualified professionals who meet market demands, thus providing essential talent reserves for local economic development. Finally, the localization of technological adaptation and project implementation demonstrates Gansu's adaptability in collaborative innovation. By addressing local needs, collaboration projects have shown increased operability and market competitiveness.

In summary, while Gansu Province faces multiple challenges in IUR collaboration, there are also significant advantages in terms of policy support and talent development that can be

leveraged. Future collaboration development should further strengthen government-led institutionalized collaboration mechanisms, promote the diversification and sustainability of collaboration models, and achieve effective sharing and utilization of innovation resources. This will enhance overall innovation capacity and contribute to the high-quality development of the regional economy.

Policy and Practical Recommendations

Based on the findings of this research, the following policy and practical recommendations are proposed to optimize the effectiveness of IUR collaboration in Gansu Province. These recommendations aim to enhance the breadth and depth of collaboration, improve the marketization of research outcomes, optimize the integration and utilization of innovation resources, and strengthen the relationships between key participants, ultimately promoting high-quality economic development in Gansu.

(a*) Enhancing Policy Execution*

Insufficient policy execution often leads to the inability of well-designed policies to achieve their intended effects in practice. To address this issue, Gansu Province needs to take several steps to enhance policy execution and ensure effective implementation at the local level. First, a robust policy execution monitoring mechanism should be established to ensure smooth implementation from top to bottom. This mechanism should include regular policy execution evaluations, feedback and adjustment processes, and a fast-track solution channel for issues encountered during policy execution. These measures will help improve the effectiveness of policies and ensure that they provide tangible support for IUR collaboration.

Additionally, Gansu Province should develop locally adaptive implementation guidelines to ensure that policies are applied flexibly based on local circumstances. Gansu's regional characteristics and economic development needs are unique, and policy implementation should fully consider these factors to avoid a "one-size-fits-all" approach. By creating flexible and practical implementation plans, the effectiveness of policies will be significantly enhanced.

Resource investment is another crucial factor in improving policy execution. The government should increase resource input into the departments responsible for execution, enhancing their capacity and professionalism. For instance, by increasing financial support, providing specialized training, and bringing in external experts, the execution capacity of relevant departments can be strengthened, ensuring that the policy's original intent is successfully translated into practical outcomes. The government should also regularly review and reflect on any issues that arise during policy execution and adjust policies as necessary to ensure their sustainability and adaptability.

(b) Optimizing Resource Integration Mechanisms

Improving the efficiency of resource integration is key to enhancing the effectiveness of IUR collaboration. Gansu Province should consider establishing a unified resource-sharing platform to ensure that research facilities, talent, and funds can be centrally managed and optimally allocated. The construction of this platform should fully integrate innovation resources both within and outside of Gansu, facilitating resource sharing and co-development, and preventing resource dispersion and redundant investments. Through this

platform, closer collaboration between research institutions, enterprises, and universities can be achieved, enabling the sharing of the latest research findings and technological resources, thereby creating a strong synergy for innovation.

The establishment of joint laboratories and R&D centers is an important initiative to optimize resource integration mechanisms. Gansu Province can encourage the creation of joint laboratories or R&D centers through policy guidance and financial support, where universities and enterprises work together. These laboratories or centers should focus on Gansu's key industries and areas of expertise, concentrating resources and efforts to solve technological challenges and promote innovation. For example, in Gansu's agricultural, mineral, and new energy sectors, the establishment of joint laboratories could effectively enhance technological innovation capabilities and promote the high-quality development of these industries.

Cross-regional resource integration is also a crucial way to improve innovation capacity. Gansu Province should strengthen cooperation with neighboring provinces to establish cross-regional resource-sharing and collaborative innovation mechanisms. Such cooperation would not only bring in more external resources but also enhance Gansu's competitiveness through regional innovation collaboration. For example, through cooperation with neighboring provinces in areas such as technological innovation, talent development, and industrial growth, optimal resource allocation can be achieved, boosting the innovation capacity and economic competitiveness of the entire region.

(c) Breaking Through Marketization Bottlenecks

The marketization of research outcomes is the key step in turning research achievements into real economic benefits. To break through the bottlenecks in this process, Gansu Province should take several measures to enhance the marketization rate of research outcomes. First, improving the technology evaluation system is critical. Gansu should introduce independent third-party evaluation agencies to improve the fairness and success rate of technology transfer. The independence and professionalism of these third-party agencies will help ensure that the market application potential of research outcomes is objectively and fairly assessed, avoiding barriers to technology transfer caused by conflicts of interest.

A complete technology evaluation system should include accurate market demand forecasting and comprehensive evaluations of research outcomes. Gansu Province should strengthen market research and demand forecasting to help universities and enterprises better understand market trends and changing demands. By accurately capturing market needs, the process of transferring research outcomes will be smoother, thus increasing the success rate of marketization. Furthermore, the government should develop a series of incentive policies, such as tax breaks and financial subsidies, to encourage long-term, stable cooperation between universities and enterprises, ensuring that innovation outcomes are successfully transformed into marketable products.

Government support is critical for the success of marketization. In policy formulation, the government should balance market orientation and research innovation, using policy guidance to foster close collaboration between universities and enterprises during the technology transfer process. At the same time, the government should provide greater

support for the technology transfer process, such as offering financial subsidies, technical guidance, and market promotion services, to help research outcomes quickly enter the market.

(d) Strengthening Localized Collaboration Models:

Strengthening localized collaboration models is key to promoting the development of Gansu's distinctive industries. To better leverage the region's advantages, it is recommended that Gansu establish regional industrial innovation centers to concentrate resources and promote technological breakthroughs and upgrades in local industries. These innovation centers should focus on Gansu's key industries, such as agriculture, minerals, and new energy, and form a technology innovation system driven by industrial needs by integrating the resources of universities, enterprises, and research institutions.

The establishment of innovation centers will not only promote technological innovation but also enhance the technological level and market competitiveness of local enterprises. By creating a platform to connect enterprises and universities, information flow and resource sharing can be facilitated, further deepening the application of localized collaboration models and ensuring that projects fully utilize local resources and meet local market demands. For instance, in the agricultural sector, Gansu can drive the development and promotion of new crop varieties through the construction of innovation centers, improving agricultural productivity and upgrading the agricultural industry.

The government should play an active role in promoting localized collaboration models. It should increase support for local key industries, particularly through policies and financial incentives, to encourage universities and enterprises to jointly develop new products and technologies, driving high-quality local economic development. During implementation, the government should flexibly adjust collaboration strategies and pathways based on local realities, ensuring the effectiveness and sustainability of localized collaboration models.

Additionally, the government should promote inter-regional cooperation and exchange, learning from the successes of other regions to enhance the level of localized collaboration. For example, by learning from other provinces' experiences in establishing industrial innovation centers, Gansu can optimize its own localized collaboration models, increasing the success rate and economic benefits of collaborations.

(e) Comprehensive Strategy Balancing Recommendations:

In promoting IUR collaboration, Gansu Province needs to adopt a series of comprehensive measures to balance the challenges and opportunities in collaboration. First, improving policy execution should be a priority, achieved through enhanced supervision mechanisms, optimized policy content, and increased resource input to ensure effective policy implementation at the local level. Second, optimizing resource integration should involve the creation of a unified resource-sharing platform and cross-regional collaboration mechanisms to ensure the most effective use of various resources.

In terms of marketization, Gansu should improve the technology evaluation system, strengthen market research, and optimize the benefit-sharing mechanisms to break through the bottlenecks in technology transfer and promote the effective application of innovation

outcomes. Finally, strengthening localized collaboration models should involve establishing regional industrial innovation centers, increasing policy support, and fostering deeper cooperation between enterprises and universities to drive technological innovation and upgrades in local key industries.

By implementing these strategies comprehensively, Gansu Province can overcome existing obstacles and bottlenecks in IUR collaboration, fully leverage local advantages, and promote high-quality regional economic development. Gansu should continue to innovate and optimize collaboration models, take full advantage of policy support and government involvement, and enhance the overall level of technological innovation and economic development in the province, ultimately achieving sustained healthy growth in the regional economy. In this process, the government, enterprises, and universities should establish closer collaborative mechanisms, work together in innovation, address challenges, seize development opportunities, and ensure that Gansu occupies a more important position in the national innovation system.

Future Research Directions

In the study of IUR collaboration in Gansu Province, several potential development areas have been identified. Future research can focus on these fields to further analyze and promote the process of IUR collaboration.

First, an in-depth study on how to enhance policy coordination efficiency is an important direction. Currently, the policy environment is considered one of the key factors influencing collaboration outcomes. Future research can explore ways to strengthen policy communication among the government, academia, and industry, creating a more flexible policy network that can adapt to ever-changing market demands and societal contexts. This interaction and coordination of policies will help establish more innovative collaboration models, thereby improving Gansu's technological innovation capabilities and industrial competitiveness.

Second, we suggest conducting more detailed case studies on specific collaborative opportunities. For example, as a key industry in Gansu, traditional Chinese medicine (TCM) deserves focused research on how to better connect with external markets, especially in response to changes in the international market environment, to enhance the export capacity of TCM. Particularly under the dual drivers of policy support and market demand, researchers can analyze the advantages and disadvantages of different collaboration models to provide guidance for the diversified development of TCM. Research in this direction would not only enrich the practical experience of IUR collaboration but also provide new momentum for Gansu’s high-quality economic development.

Finally, research in the area of data support and quantitative analysis also deserves attention. Currently, Gansu Province lacks sufficient detailed data on TCM and other key industries, which limits in-depth analysis of the factors influencing IUR collaboration. It is recommended that future research focus on establishing reliable data collection and analysis systems, particularly by incorporating modern information technology to improve data comprehensiveness and accuracy. This would provide empirical support for policy-making and the optimization of collaboration mechanisms. Through quantitative analysis,

researchers can more clearly identify the key factors affecting the efficiency of IUR collaboration, providing a more solid foundation for future studies.

In summary, future research directions focused on policy coordination, specific industry case studies, and data quantification will play a significant role in enhancing the efficiency and sustainability of IUR collaboration in Gansu Province. These studies can also serve as valuable references for research and practice in other regions.

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