A Model Of How GIURU Collaborative Innovation Promote Regional Economic Development

Xiaochun Wu, Yang Chen*

School of entrepreneurship, Wuhan University of Technology, Hubei, China

*Corresponding author: 1772483196@qq.com

Keywords: GIURU; Collaborative innovation; Regional economic development; Inland river development

Abstract: Based on the stakeholder theory and market failure theory, this paper explores the mechanism of how to promote local economic development through collaborative innovation between government, industry, university, research and user(GIURU), using a single case study approach, and discusses how to use collaborative innovation between GIURU to alleviate the plight of local shipping enterprises and improve the efficiency of local shipping enterprises, so as to adapt to the national "carbon neutral" long-term policy trend and to meet the future transportation needs of the Beijiang River, thus promoting local economic development. This paper illustrates the principle of collaborative innovation between GIURU, and analyzes four key points to successfully promote local economic development with collaborative innovation: the coordinated driving force between government department policy support and enterprise development demand, market and government failure, the establishment of GIURU platform, and win-win cooperation between GIURU. This paper has significance in the theoretical innovation of GIURU.

1. introduction

Collaborative innovation between GIURU is the optimal allocation of resources through the efficient integration of various resources among research institutes, enterprises, universities and local government departments, which is a hot topic of academic research in Chinese academia and a real problem of concern to local government departments.

In the 1980s, Research in the direction of industry-academia research has begun worldwide. In 1987, the English scholar Freeman et al. made the first clear definition of national innovation system in the book "Technology Policy and Economic Performance: The Japanese Experience".[1]. Etzkowitz further enriched the triple helix innovation theory based on the interaction between "school-industry-government", and discussed in detail the roles and functions of government, universities and industry respectively.[2] The roles and functions of government, universities and industry are discussed in detail. The research on cooperative innovation policy in China started after the 1990s, and the research results of domestic and foreign scholars on cooperative innovation policy were mostly concentrated after the formulation of the "2011 Plan". The research results of domestic and foreign scholars on cooperative innovation policy are mostly focused on the theoretical connotation, significance, mechanism, mode, process, benefit distribution, evaluation system, problems, etc. [3]

From the perspective of organization theory, Yang Li and Changhong Yuan reveal the dynamic evolution process of GIURU collaborative innovation to enhance enterprise competitiveness.[4] However, the academic community has not yet explored how GIURU collaborative innovation drives local competitiveness. However, the academic community has not yet explored how GIURU collaborative innovation drives local economic development, not only because it enhances the competitiveness of enterprises[5] For example, solving the problem of the shallows of Shaoguan section of the Beijiang River can promote the development of the whole shipping industry of Shaoguan, and use the industry to promote the development of upstream and downstream enterprises, it also create a large number of jobs for the local community to promote local employment, and the development of

the transportation industry can also facilitate the transportation of other local industries, and other local industries to move in and promote the local economy. The development of the transportation industry also facilitates the transportation of other local industries and the settlement of other local industries, which promotes local economic development. To address the omission of existing literature, this paper explores the mechanism of GIURU collaborative innovation on regional economic development based on the cooperation project between research institutes and government.

2. Research Methodology

Since there is limited research on the innovation results of GIURU cooperation in China, and the basic theoretical and empirical research in academia is still very thin, this paper chooses a single-case study approach. The main reasons for choosing the single-case exploratory research approach include: first, the single-case study approach is conducive to exploring the "how", "process" and "mechanism" issues, and also It is also possible to refine the theoretical basis and regularity behind the phenomenon, and to justify the integrity and dynamics of the inquiry process in a more rational way.[6] In addition, the use of longitudinal case studies can facilitate the logical examination and mechanistic reasoning of key events involved in the project time series, and our researchers often use longitudinal single case studies to reveal how complex innovation processes unfold in our unique national context.[7] .

According to the theoretical sampling principle of case study, and taking into account the typicality of the case and the availability of data, this paper selects the Shaoguan Research Institute of Wuhan University of Technology (SRIWUT) and its completed "demonstration project of improving the capacity of the Beijiang River waterway (BRWP)" to carry out the case study work. The case study is representative and typical, and is a successful example of GIURU innovation to promote local economic and social development. At present, when studying the cooperation and innovation relationship between local GIURU, most Chinese academics choose the Industrial Technology Research Institute as the main research object.[8] Therefore, this paper will continue this experience.

The data in this study mainly include four types of data: symposium, field research, primary data, and secondary data, specifically 1) minutes of five symposiums 2) results of field research in Wushi Port 3) primary data provided by government departments such as shipping enterprises, Maritime Bureau and Hydrographic Bureau 4) secondary data from relevant construction programs, plans, and evaluation reports.

The five symposia are a process of discussion, collation and aggregation, and we will follow Eisenhardt's (1989) specification of recording the details of the symposia in each 24hour, and summarize the transcript of each symposium through audio transcription into text, the researcher's impressions of the whole, field notes, and post-meeting consultations and discussions with experts and scholars The final product is about 5,000 words. Finally, we have compiled about 5,000 words of first-hand symposium minutes, more than 15,000 first-hand data submitted by various departments such as ship enterprises and maritime bureaus, hydrographic bureaus, etc., as well as secondary data materials totaling 933 pages, 13 reports and nearly 1,030,000 words, which constitute a large database of this case study.

The research object is Shaoguan section of Beijiang River, which has a total length of 468km and a total basin area of 46710km2. 49km2 of which are under the jurisdiction of Shaoguan, with a basin area of 17299km2, and is the only waterway connecting the Pearl River Delta and Hong Kong and Macao in northern Guangdong, with a prominent shipping status, and currently Beijiang River is one of the three channels in the new pattern of "one horizontal and one network" in Guangdong Province. "At present, Beijiang is one of the three channels in the new pattern of waterway of Guangdong Province. Figure 1 below shows the geographical location of the Beijiang River, the main stream of the Beijiang River from Shaoguan to the mouth of the Sanshui River has been built along the Mengzhouba, Mengli, Baishiyao, Feilaixia, Qingyuan, a total of five water conservancy hubs are marked in the map.

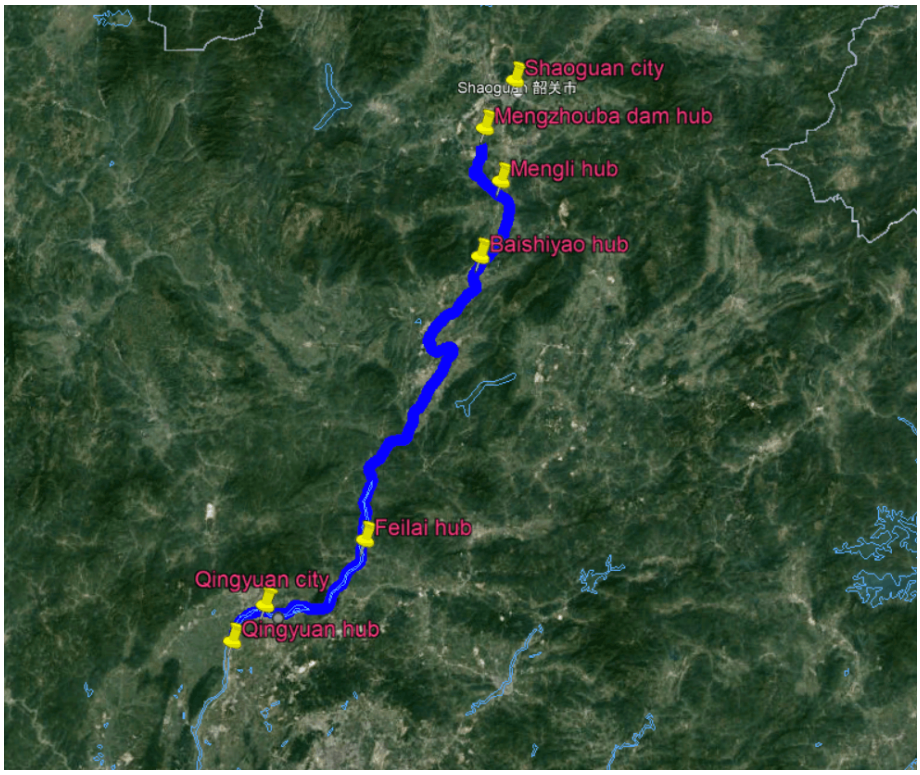

Figure 1 Geographical location of Beijiang

The article focuses on the demonstration process of the North River Navigation Project to analyze how the innovation of GIURU cooperation has promoted the development of local economy and society. The whole R&D process follows the general framework and process of case R&D constructed by the theory: research initiation, selection of R&D cases, selection of R&D tools and methods, data acquisition, data analysis, hypothesis building, conversation with documents, and completion. This paper follows Plowman et al. (2007) [9]:

Step 1: Use the symposium summary sheet. Record the topics, questions and suggestions for each symposium;

Step 2: Reconstruct the timeline. The timeline was based on the subjective recollections and objective reports of significant matters by the participants in the symposium. We also asked project managers and key participants and revised this timeline as shown in Table 1 below;

Step 3: Validity check. We checked the validity of our survey through four types of data: symposium, field survey, first-hand statistics and secondary data. We also submitted the first draft 1of the table to the leadership of SRIWUT for review, and then revised the table1 after obtaining the response.

Table 1 North River Waterway Project Schedule

Time	Events / Actions
End of 2020	SRIWUT was established as an innovation platform integrating "GIURU"
2021/7/20	Shaoguan Port Office began to commission SRIWUT to write "to enhance the capacity of the Beijiang channel demonstration report", to explain the background and needs of the writing, to become the municipal people's Congress proposal support materials
2021/8/4	The first symposium was held in SRIWUT, attended by the director of the port office of the Municipal Bureau of Transportation, the professor of SRIWUT, the general manager of the ship company, the deputy director of the command center of Shaoguan Maritime Bureau, respectively, to explain the current problems and views of the Beijiang River

2021/8/10	Prof. In SRIWUT and two postgraduates went to Wushi Port to conduct field research by boat to check the location of the shoal and the actual situation of the river, and to conduct the second symposium in the Maritime Bureau to consult relevant information and data.
2021/8/17	The leaders of the port office came to SRIWUT to start the third symposium to check the progress of report writing, and to clarify the direction of writing to prevent deviation
2021/9/6	The Director of the Port Office of the Municipal Bureau of Transportation hosted the fourth forum of the project in Shaoguan Port Office, attended by Shaoguan Port Office, Maritime Bureau, Water Affairs Bureau, Waterway Affairs Center, Port and Maritime Association, ship enterprise representatives, SRIWUT experts, to discuss the issues and recommendations of the report and the first draft of the proposal writing
2021/9/16	Shaoguan People's Congress Standing Committee held the fifth forum of the project, thematic discussion of the report and the first draft of the proposal writing problems and suggestions, according to the above comments revised, SRIWUT to complete the project

According to the definition of previous scholars, this paper defines the innovation of GIURU cooperation as the scientific division of labor, advantageous connection, in-depth cooperation and coordinated cooperation among the five main bodies, such as government departments, enterprises, universities, research institutions and users, to carry out innovative activities.[10] The project is based on the "North River" project. This project is based on the proposal of the National People's Congress on the improvement of the capacity of the Beijiang waterway. The development of the inland waterway transport industry plays a large role in driving urban development, regional economic growth and improvement of people's living standards, and also has significant significance for improving the transportation environment and urban ecological environment.[11] The development of the inland water transport industry has played a large role in driving urban development, regional economic growth and improvement of people's living standards, as well as improving the transportation environment and urban ecological environment.

Currently, Chinese scholars usually analyze technological innovation platforms and innovation projects in isolation in GIURU cooperation technological innovation studies, but the data in the table1 reveal two alternating stages between the successful establishment of GIURU cooperation technological innovation platforms and the successful realization of the projects, the whole successful course begins with the successful establishment of SRIWUT, government support and enterprise demand is the key to enhance the regional economic development. The completion of the project has really promoted the development of regional economy.

3. Analysis of the conditions of GIURU collaborative innovation for regional economic development

3.1 Double failure of market and government

Existing research suggests that in case of market failure, government intervention can be used to solve the problem, and the government can solve the market failure through supportive policies, but when the market and the government fail to solve the problem at the same time, and when there is a lack of theoretical and technical support, using the technical power of universities and research institutes, GIURU collaborative innovation is a good solution.

So we propose:

Proposition1: Market and government failure is a prerequisite for collaborative innovation between GIURU.

Based on a large amount of information and data collected, we believe that the main basis of this proposition is: 1) from the government side, Shaoguan Port Office, the person in charge of: "in the

proposal of the demonstration program experts in SRIWUT is professional, but also help us save a lot of energy"; 2) from the university side, "turbine engineering, shipbuilding and marine engineering is the ace discipline of Wuhan University of Technology, the national specialties, Hubei Province brand specialty, shipbuilding and marine engineering is a national key discipline"; 3) from the enterprise side, Shaoguan City, the local ship enterprises: "enterprises do not have the power and funds To solve the problem of the Beijiang waterway can only rely on the power of the government; 4) from the research institute, SRIWUT has professors, doctoral students and post-doctoral fellows of turbine engineering and ship and marine engineering based here, with professional technical personnel power, can do adequate and professional demonstration, including They will also explain the reasons for the failure to meet the navigability standards, such as irrigation, flood control, reef stranding, lack of coordination of information from upstream and downstream power stations, and the lack of digital maps for seafarers who are unfamiliar with the route. In conclusion, all the above-mentioned sources of statistical evidence support the proposition1 in a uniform manner.

Why do we say that the premise of GIURU collaborative innovation is market and policy failure? According to the theory of market failure, when enterprises lack the power and capital to solve problems, but the efficiency of enterprises affects the local economic development, the government attaches importance to intervention requires scientific evidence and evaluation, and the GIURU platform is a good choice.[16] The government should pay attention to the intervention of scientific evidence and evaluation, and the GIURU platform is a good choice.

3.2 Establishment of GIURU platform

The current research results report that in the collaborative technological innovation of GIURU, the construction of collaborative technological innovation network platform of government departments is important for information resource sharing, and government departments should accelerate the formation of information platform resource sharing mechanism. The research results of this case show that there are defects in each theme collaborative innovation platform, so it is recommended to this paper:

Proposition2: The GIURU collaborative innovation platform jointly formed by government departments and institutions of higher education is an important foundation for the government to guarantee the realization of social collaborative innovation goals.

According to the information and data collected, we propose this proposition based on: 1) from the government side, Shaoguan city leaders said: "SRIWUT has a professional team of professors, can carry out professional argumentation and proposal support"; 2) from the university side, Wuhan University of Technology and SRIWUT signed a cooperation agreement, a year to organize 50 From the enterprise side, the general manager of the local shipyard said: "The design of the standard ship type, the related bridge and anchorage transformation, the cost calculation of dredging and so on all need to rely on SRIWUT"; 4) From the research institute side A leader of SRIWUT pointed out that "the establishment of Shao Research Institute can well serve the local enterprises in Shaoguan City and solve technical problems". In conclusion, the above sources of data evidence are consistent in supporting proposition 2.

Why is the construction of GIURU platform crucial? According to the doctrine of information asymmetry, the information existing in a certain distribution state presents inconsistency and asymmetry in the social organizations and individuals corresponding to each other, which can be understood as different organizations and individuals have different degrees of information about certain things[13] The construction of GIURU platform is a good way to break this information barrier, as the government has a vague perception of technology and universities have a vague demand for government and enterprises. In addition, platform construction can only be the foundation, and it needs to rely on specific projects to achieve local economic development, and the lack of central policy to guide the organization of collaborative innovation is not conducive to the sustainable development and deepening of collaborative innovation.

3.3 Government support and business demand binary synergy drive

The current research results we understand that the market and policy play a big role in the cooperation between industry and research, policy guidance and support to guide the market [12] Policy guidance and support guide the market. This case study shows that only understanding the role between government and market is not enough, so this paper has proposed:

Proposition3: In the era of economic transformation, the dual drive of policy support and market demand drive synergistically promotes the cooperation and innovation of local governments in industry-university-research and eventually realizes.

We put forward this proposition based on: 1) market demand pull policy change, in the project, the first point, Wushi port field research, the existing shallows impede the passage of ships, affecting economic efficiency; second, "carbon neutral" background, public to water, rail-water intermodal transport is an inevitable trend[15] According to the "Shaoguan Port Beijiang Port Area Comprehensive Transportation Plan", the scale of bulk cargo transportation, the bulk cargo throughput of Beijiang Port Area in 2025 will reach 16.8 million, while as shown in Figure 2, the throughput in 2020 is only about 300 tons, the current situation of the waterway does not meet the development needs; 2) when the local industry faces the need to solve the problem, the government should The mayor and secretary attached great importance to this issue and referred to the Port Office of the Municipal Transportation Bureau to discuss the necessity and plan for upgrading the capacity of the Beijiang channel. In conclusion, the various sources of data evidence above are consistent in supporting the proposition3.

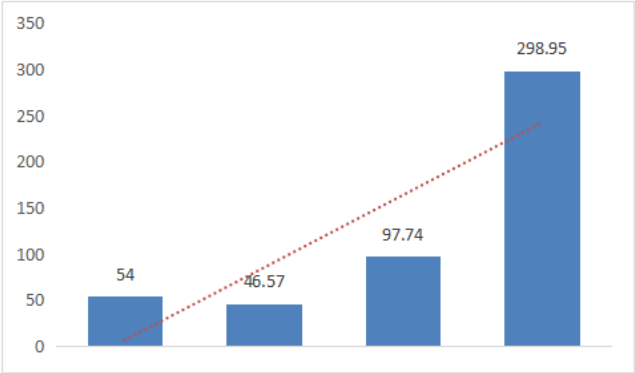

Figure 2 Shaoguan Port Throughput Change Trend 2017-2020

Why government policy support and market demand must be coordinated through the dual structure of the driving force of this and that to ensure the coordinated innovation and results of government industry, academia and research? According to the theory of market failure, the main function of government in the process of science and technology transformation and industrialization is to solve the "market failure phenomenon", so as to play the regulating ability of government.[16] At the same time, according to the theory of supply and demand balance, it is because of the demand of enterprises to solve problems that the government can pay attention to.

3.4 Win-win for all parties in the GIURU alliance

Some researchers have proposed that the strategic alliance of industry-university-research is an advanced form of industry-university-research collaboration and is the main mode of technological innovation cooperation and strategic competition in various countries today. In order to promote the alliance parties to seek harmony among many contradictions, it is necessary to establish a win-win system of strategic alliance of industry-university-research with a systematic perspective [14] In order to promote the harmony among many contradictions between the parties of the alliance, it is necessary to establish a win-win system of strategic alliance between industry and university with a systemic perspective. Therefore, we propose:

Proposition 4: Achieving win-win situation is the key to collaborative innovation between GIURU.

According to the information and data collected, we put forward this proposition based on:1) from the government side, Shaoguan City People's Congress Standing Committee on all sides of the representatives said: "to enhance the passage of the Beijiang channel is to adapt to the needs of Shaoguan's economic and social development, Shaoguan Port Beijiang channel as Shaoguan City water and land transportation hub and an important transportation infrastructure channel, in promoting regional economic development, optimize the city and Industrial spatial layout will play an important role." 2) from the school side, a school leader has said: "Wuhan University of Technology has been thinking about how to use the scientific and technological achievements of universities to effectively serve the local economic and social development", the interests of universities and local governments converge; 3) from the enterprise side, for Shaoguan City and local shipping enterprises: " The existing shoal problem of Beijiang River has hindered the passage of boats, on average, one pair of propellers is broken in a month, 4000 a pair, the navigation rate has not reached the current standard of the three-stage inland waterway, the economic benefits of enterprises still have room for improvement", solving the existing problems on the Beijiang waterway also meets the practical benefits of the company; 4) from the Institute's point of view, " SRIWUT is committed to Shaoguan local enterprises to solve practical problems, the use of scientific and technological achievements of universities to enhance the economic benefits of Shaoguan City", Shao Research Institute has converged with the requirements of local government interests. In conclusion, all the above sources of statistical evidence are unified to support the proposition4.

Why do we say that the basic requirement of collaborative technological innovation between government, industry, academia, research and use is to achieve win-win situation? According to the stakeholder theory, GIURU-technology collaboration is a community of interests formed by departments, companies, universities, research institutions and users, emphasizing that all parties work for the shared goal and meeting the interests of all parties is a necessary condition for cooperation.[14] It is necessary to meet the interests of all parties.

3.5 A Model of How GIURU Collaborative Innovation Promote Regional Economic Development

Based on the above analysis, four important factors are identified for GIURU collaborative innovation to promote regional economic development: market-government dual failure, establishment of GIURU platform, coordination drive of government department policy support and enterprise development demand duality, and win-win situation for all parties of GIURU alliance, which play the roles of prerequisite, foundation guarantee, duality drive and key requirement, respectively. The model also has certain boundary conditions, and the limitations are discussed in the last chapter of this paper, to be supplemented and corrected by more scholars.

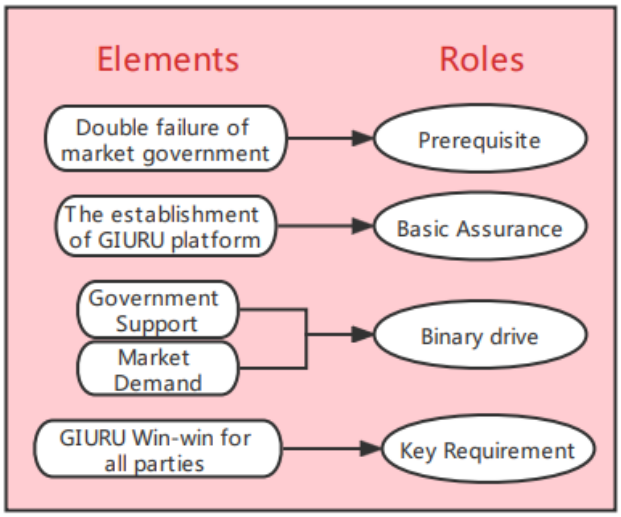

Figure3 The four elements model of GIURU collaborative innovation for regional economic development

4. Discussion and Conclusion

The paper takes the North River waterway construction project participated by SRIWUT as the research object, and explores how the construction project will promote local economic development with the results of GIURU and cooperative innovation by using case studies. The results of the study point out that the successful promotion of local economic development by GIURU is a dynamic and progressive process, which goes through four joints: market and government failure, establishment of GIURU platform, coordination between government departments and enterprise development needs, and win-win cooperation between GIURU.

The theoretical contributions of this paper mainly lie in the following: firstly, the paper explores how the collaborative innovation between government, industry, university and research can promote local economic and social development, which complements the previous theoretical research on collaborative innovation between government, industry, university and research and further enriches the basic theory and empirical research on collaborative innovation between government, industry, university and research; secondly, by using case studies and field surveys, the paper analyzes the dynamic process of collaborative innovation between government, industry, university and research through empirical research. Secondly, by using case studies and field surveys, we analyze the dynamic process of GIURU collaborative innovation through empirical research and point out four important conditions and corresponding propositions for promoting GIURU collaborative innovation to drive local economic and social development.

This paper has obvious inspirations: first, in the case of simultaneous failure of technology market development and policy, a collaborative innovation platform relying on local universities with high degree of science and technology transformation is established, and with the strong guidance and mechanism arrangement of local government departments, the effective integration of technical resources and strengths of all parties involved in industry, academia, research and application is carried out to solve the problems faced by local enterprises and enhance the performance of local government, Secondly, through government departments and market demand to promote the dual structure of the drive to promote the success of local GIURU cooperation and innovation, policy guidance is pushing, market demand is pulling, and the final benefit is the local enterprises, regional employment rate, income, social welfare benefits; Finally, GIURU alliance win-win is the key to the success of GIURU collaborative innovation, in the For example, in the context of "carbon peak, carbon neutral", all provinces are doing carbon peak related "14th Five-Year Plan", in the field of shipping, the future inland waterway In the field of shipping, the future deployment of ships is more intelligent and green, and the research and development and application of biofuel, methanol and LNG ships should be promoted.[15] SRIWUT needs to actively promote and cooperate with the construction of related projects accordingly.

Of course, there are some shortcomings in the research method of this paper. In the article, only the North River waterway construction project in which SRIWUT was involved was taken as the research object, and a single case study was adopted to analyze the important mechanism and key points of local GIURUcollaborative innovation to promote regional economic and social development, and the universality of the analysis conclusion needs to be further improved, and future research can further supplement, deepen and expand the research results of the article through multiple case studies and large sample experimental research. The findings of this paper can be further supplemented, deepened, and expanded through multiple case studies and large sample experiments. Nevertheless, this paper fills the theoretical gap of the relationship between GIURU collaborative innovation and regional economic and social development in China.

Acknowledgements

Thanks to the fund support from the doctoral workstation of Shaoguan Research Institute of Wuhan University of Technology.

Fund support: Project of Doctoral Workstation of Shaoguan Research Institute of Wuhan University of Technology in Guangdong Province (2021050746)

References

[1] Freeman, C., 1987, Technology Policy and Economic Performance-lessons. from Japan, London: Printer Publishers.

[2] ETZKOWITZ H, LEYDESDORFF L.The triple helix of university-industry-government relations: a laboratory for knowledge-based economic development[J EASST review,1995,14(1):14-19.

[3] Wang Daoxun.Research on Collaborative Innovation of Government, Industry, University, Research, and Application in Local Places[J]. Journal Of HuangHe S&T College,2021,23(07):44-47+55.

[4] LI Yang,YUAN Chang-hong,WANG Tao,CHEN Zhi-qiang.How does government-industry-university- research-user collaborative innovation promote enterprise competitiveness?[J].Studies in Science of Science,2016,34(11):1744-1757.

[5] Yuan Changhong,Zhang Fen,Yao Jianjun,Sun Huijuan.Collaborative innovation of GIURU and firm competitiveness improvement[J]. Management,2015,36(12):1-8.

[6] Jiang Qing zhe.Serving country's major strategic needs to ef-fectively promote I-U-R collaborative innovation[M].China Higher China Higher Education,2013(3/4):27-29.

[7] Chen Fengwen Fu Longwang Zhang Lu Yu Xiaoyu.A Longitudinal Case Study from Integration Perspective: How Do the Individual Learning and Organizational Learning Interactively Influence the Firms' Innovation Behaviors?[J].Management World,2020,36(03):142-164.

[8] Zhang Hualun,Song We,Wang Jinjin.Study of advanced technology institute-Research of GIURU collaborative new mode[J].Chinese University Scienc& Technolgy,2014(3):64-66.

[9] Eisenhardt K.M.. Building theories from case study research [J].Academy of Management Review,1989,14 (4):532-550.

[10] Plowman D.A..Baker L. T. ,Beck T. E. et al. Radical change accidentally:The emergengce and amplification of small change[J]. Academy of Management Journal,2007,50 (3),515-543.

[11] KONG Yan-li, YANG Zong-xiao, YAO Xia, CHEN Jing-yun, HU Xin-ming.Discussion on the Collaborative Innovation of "Government, Industry, University, Management & Technology of SME,2021(10):155-157.

[12] Wu Cuicui.Study on the Contribution and Strategy of Jiangxi's Water Transport Industry to Regional Development[D].East China Jiaotong University, 2019.

[13] Li Jian. I-U-R collaborative innovation is the new development of I-U-R cooperation [J]. Science & Technology Industry of China,2014(1):42-44.

[14] Zhao Xiaoling. Research on the relationship between corporate social responsibility behavior and green brand equity from the perspective of Information asymmetry[D]. Northeast Forestry University, 2021.

[15] Zhang Daoliang,Wang Zhangbao.Discussion and Analysis of the win-win mechanism of the Industry-University-Research strategic alliance[J]. Technology and Industry,2012,12(01):30-34.

[16] Liu Jianguo.Analysis of the Low-Carbon Development Path under the "Carbon Peak and Carbon Neutrality" goal[J].China Ocean Shipping,2021(08):26-28+. 6.

[17] Wang Ying. Research on Improving the Urban Housing Security System in china in the Perspective of Correct housing market failure[D]. Chinese Academy of Fiscal Sciences, 2019.