

Study on the Ways of Government-Industry-University-Research Collaboration to Drive Enterprise Value Creation from the Perspective of New Quality Productivity—A Case of Jereh Group

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Abstract. Under the strategic background of the accelerated cultivation of new quality productivity, government-industry-university-research collaboration has become the core path to activate enterprises to improve their value creation capacity. Based on the analysis framework of "Demand Drive - Resource Integration - Achievement Transformation - Value Creation", this paper takes Jereh Group as a case and uses the case study method to systematically explore the internal logic and realization path of government-industry-university-research collaboration driving enterprise value creation from the perspective of new quality productivity. The study finds that government-industry-university-research anchors the demand direction through government policy guidance, gathers innovation elements by integrating the resources of multiple subjects centered on the three-dimensional characteristics of new quality productivity, realizes the industrialization of technology by virtue of the achievement transformation mechanism, and ultimately drives enterprise value creation. This paper enriches the cross research on the synergy between new quality productivity and government-industry-university-research collaboration, provides experience reference for enterprises to cultivate new quality productivity and improve value creation capacity with the help of synergy, and also provides policy reference for the government to optimize the collaborative ecology.

Keywords: New quality productivity, Government-Industry-University-Research Collaboration, Enterprise Value Creation, Jereh Group

1. Introduction

At present, the cultivation of new quality productivity led by scientific and technological innovation and centered on high-quality development has become a key support for promoting economic transformation and upgrading and enhancing the core competitiveness of enterprises. The report to the 20th National Congress of the Communist Party of China clearly puts forward "accelerating the development of new quality productivity", emphasizing the strengthening of the dominant position of enterprises in scientific and technological innovation and promoting the in-depth integration of

the "four chains" [1]. As an important model for integrating resources and opening up the "last mile" of the transformation of scientific and technological achievements, the collaboration between government, industry, universities and research institutions is deeply integrated with the cultivation of new quality productivity, injecting new impetus into enterprise value creation [2]. Through the complementary advantages of multiple subjects, it can solve the development problems of enterprises, promote the agglomeration and redistribution of resources, accelerate the transformation of scientific and technological achievements, and thus enhance enterprise value [3].

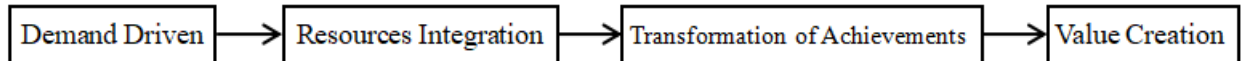


Figure 1. Research roadmap of the path

However, in practice, some collaborations have problems such as poor mechanisms and disconnection in transformation, and their value-driven role is restricted. In view of this, this paper selects Jereh Group, which is highly representative in the industry and has a mature collaboration model, as a case study. Based on the research logic of "Demand-driven-Resource integration-Achievement transformation-Value creation", it explores the specific paths of government-industry-university-research collaboration driving enterprise value creation from the perspective of new quality productivity. The purpose is to provide practical reference for enterprises to cultivate new quality productivity and realize value creation through collaboration, and enrich the research results in related fields.

2. Literature review and theoretical framework

2.1. New quality productivity

Scholars have deeply studied the development of new quality productivity from different perspectives. They all regard its development as an advanced, green, innovation-driven and efficient process of productivity realization. It is of great significance for promoting the high-quality development of economy and society. Xu Zheng and others have proved that under the background of high-quality economic development, new quality productivity improves the resource utilization rate of the manufacturing industry by improving resource allocation and updating production methods. It promotes the iteration and upgrading of production modes, the upgrading of industrial structure, and accelerates the integration of manufacturing and service industries, becoming a new driving force for the transformation and upgrading of traditional manufacturing industry [4]. Zhong Maochu and others define new quality productivity as a cutting-edge and advanced form of productivity. He believes that this kind of productivity is a leading force formed by taking "disruptive technological innovation" as the core production factor and effectively allocating other resource factors [5].

2.2. Operation mechanism of government-industry-university-research collaboration

When studying the operation mechanism of government-industry-university-research collaborative innovation, domestic scholars analyze the roles and tasks of collaborative participants from the perspective of the participants, thus revealing the internal principles of the collaborative operation mechanism. In their research, Peters and Fusfeld divide the cooperation modes between enterprises, universities and research institutes into two types: "simple" and "complex" according to the specific

cooperation methods. The "simple" type of cooperation mode means that the two sides of industry-university-research cooperation only communicate by telephone, and the cooperation is not in-depth. The "complex" type of cooperation mode means that the two sides of industry-university-research cooperation carry out in-depth cooperation through various ways [6]. From a theoretical perspective, the government-industry-university-research collaboration mode is also called the triple helix model, represented by scholars Etzkowitz and Leydesdorff. They hold that: "The triple helix model is a collaborative mode of effective interaction formed by the government, universities and industries through organizational and institutional coordination mechanisms in the cooperation process, so as to use scientific and technological resources with high efficiency and effectiveness, and ultimately realize the evolution and upgrading of the innovation system." [7] At the initial stage, this model was mostly used in the research of national and regional innovation, focusing on explaining the motivation and coordination mechanism of the three parties in the innovation process, that is, how to "promote the construction of the innovation system and the substantive improvement of innovation capacity through the efficient use of various production factors and resources with science and technology as the core." [8]

2.3. Synergetics theory

As a highly influential interdisciplinary theory, synergetics originated in the 1970s. It was founded by Hermann Haken, a famous German physicist, based on in-depth research on laser systems. In the exploration of laser phenomena, Haken keenly found that different types of systems have common internal laws in the evolution process from disorder to order. This pioneering understanding of the self-organization phenomenon of laser systems laid a solid foundation for the birth of synergetics. With the deepening of theoretical research, the application boundary of synergetics has been continuously expanded. It has gradually crossed the natural science fields such as physics, chemistry and biology, and extended to the social science fields such as sociology and economics. It has developed into a comprehensive interdisciplinary theoretical system aiming to reveal the universal laws of the evolution from disorder to order and from low-level order to high-level order in complex systems [9].

3. Research design

3.1. Research method and selection of case enterprise

Based on the research dimensions of "why" and "how", this paper adopts the longitudinal single case study method, aiming to reveal the internal mechanism and path of government-industry-university-research collaboration driving enterprise value creation. Jereh Group is selected as the case enterprise mainly because of its remarkable achievements and industrial representativeness in government-industry-university-research collaborative innovation. Jereh Group not only has profound technical accumulation and market influence in the field of special equipment manufacturing, but also shows strong collaborative capabilities in promoting technological innovation and industrial upgrading. Through close cooperation with universities and research institutions, it has realized the effective connection between technological R&D and market demand, promoted the accumulation and transformation of intellectual property rights, and enhanced the core competitiveness of the enterprise. In addition, Jereh Group's practices in intelligent manufacturing and green transformation have provided valuable experience for the industry, with high research

value and reference significance. Therefore, Jereh Group is an ideal case for studying the government-industry-university-research collaborative innovation model.

3.2. Introduction to the case enterprise

Jereh Group was founded in 1999, with its headquarters in Yantai, Shandong Province, and was listed on the Shenzhen Stock Exchange in 2010. With special equipment manufacturing as its core, the company's business covers high-end equipment manufacturing, oil and gas engineering services, environmental governance, new energy and other fields, and it is a national technological innovation demonstration enterprise. Relying on its global layout and technological R&D advantages, it focuses on the intelligent upgrading of energy equipment, and has filled industry gaps with a number of technological achievements. With the acceleration of the global energy transition, Jereh Group has keenly captured the huge development potential in the new energy field and actively deployed new energy businesses. Through continuous technological innovation and product R&D, the company has made important breakthroughs in new energy equipment manufacturing and energy storage technology, providing strong support for promoting the development of the new energy industry.

Jereh Group has always focused on the field of government-industry-university-research collaboration and participated in building a cooperative ecological system with the linkage of multiple subjects. In 2015, the project of "Networked Collaborative Manufacturing for Offshore Oil and Gas Equipment", which the company applied for jointly with research institutions, was successfully approved as a special project of intelligent manufacturing by the Ministry of Industry and Information Technology, and obtained financial support from Shandong Province for major scientific and technological projects. In 2021, the company not only signed a major integrated project of lithium-ion battery anode materials with the local government, but also established a joint venture with Jiageng Innovation Laboratory and Xiamen University to focus on overcoming the core technology of silicon-based composite anode materials. In 2023, as the organizer, Jereh held the talent introduction activity in Yantai City, receiving teachers from 19 universities across the country to gather at Jereh for in-depth discussions on college students' employment and in-depth school-enterprise cooperation. In 2024, Jereh University built an online and offline integrated vocational skills training system, has cultivated a large number of skilled talents accumulatively, and created a demonstration sample of industry-education integration. At the same time, through initiatives such as continuously sponsoring the National Postgraduate Energy Equipment Innovation Design Competition and deepening university-local-enterprise cooperation with universities such as Yantai University, it has built a diversified platform for talent and technical exchange and scientific research collaboration.

3.3. Data collection

This paper uses Nvivo software to sort out and analyze primary data and secondary data. Based on the principle of triangulation verification, the data sources are as follows: first, the enterprise annual reports, semi-annual reports and social responsibility reports publicly disclosed on the official website of Jereh Group; second, the news released on the official website of Jereh Group about the company's digital transformation and green transformation; third, public data, mainly industry news of the special equipment manufacturing industry, and reports on Jereh Group's government-industry-university-research collaboration activities from websites such as East Money Information and Sina Finance; fourth, journals and papers related to Jereh Group on CNKI (China National Knowledge Infrastructure).

4. Analysis of the path of government-industry-university-research collaboration driving enterprise value creation from the perspective of new quality productivity

This part will systematically explain how Jereh Group transforms external elements into the driving force of enterprise value creation in the whole chain through the synergy of government-industry-university-research collaboration, based on the progressive logic of "Demand Drive - Resource Integration - Achievement Transformation - Value Creation".

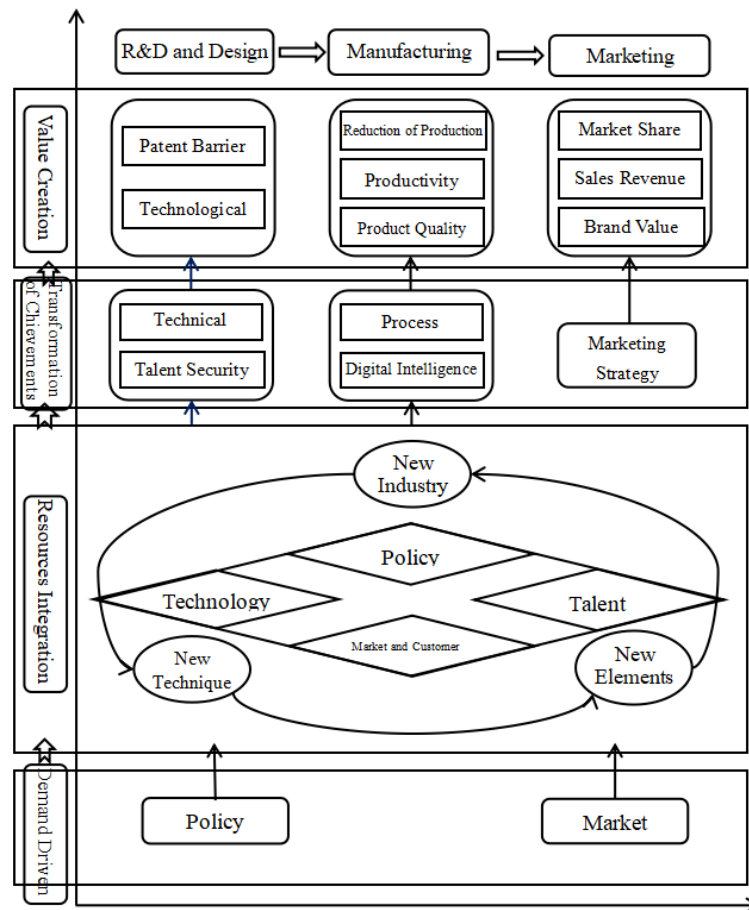


Figure 2. Evolution chart of the path of government-industry-university-research collaboration driving enterprise value creation from the perspective of new quality productivity

4.1. Demand drive: dual-wheel traction anchors the innovation direction of all links

Demand drive is the logical starting point of Jereh Group's government-industry-university-research collaboration. With policy orientation and market demand as the dual wheels, the Group accurately anchors the strategic direction of all links including R&D and design, production and manufacturing, and marketing services. From the perspective of policy drive, Jereh Group deeply aligns with the national strategic layout for the cultivation of new quality productivity and the upgrading of the high-end equipment manufacturing industry, as well as the relevant supporting policies issued by local governments. Focusing on the core fields such as the localized replacement of oil and gas equipment and the green and low-carbon transformation, the Group has included key issues such as the R&D of intelligent drilling and production equipment and the breakthrough of environmental protection fracturing technology into the key scope of collaborative innovation. From

the perspective of market drive, Jereh Group closely tracks the development trend of the global oil and gas exploration industry, especially the expansion direction of the exploration and development of deep-sea and unconventional oil and gas resources. The Group keenly captures customers' urgent demand for high-efficiency operation equipment, low-energy-consumption products and full-process service solutions, and takes this as the guide to clarify the specific direction of core technological breakthroughs, process optimization and service upgrading in each link. Through the accurate grasp of market demand, Jereh Group lays a solid targeted foundation for the subsequent resource integration and achievement transformation, ensures that innovative achievements can accurately connect with the market and quickly realize industrial application, thus occupying an advantageous position in the fierce market competition and continuously promoting the high-quality development of the enterprise.

4.2. Resource integration: multi-agent collaboration gathers all-factor innovation support

Centering on the innovation demand of each link, Jereh Group unites the government, universities and research institutes to carry out cross-agent resource integration, and realizes the reconstruction and upgrading of the three-dimensional characteristics of new technologies, new elements and new industries of new quality productivity. In the R&D and design link, it integrates the technical and talent resources of universities and research institutes, has built 7 joint R&D platforms with China University of Petroleum and Shandong University, and jointly trained more than 150 master and doctoral students. Relying on the basic research advantages of the Chinese Academy of Sciences, it focuses on tackling key technologies such as intelligent control algorithms and environmental protection material formulas. The government helps gather innovation elements to the R&D end by building technical exchange platforms and providing talent subsidies [10]. In the production and manufacturing link, it integrates the enterprise's production equipment with the process optimization experience of research institutes, introduces digital management and control technology to transform production lines. The government supports enterprises to upgrade intelligent production equipment through tax incentives and improves the intelligent level of means of labor. In the marketing service link, with the help of the industrial docking platform built by the government, it integrates industry market information and customer resources, unites universities to carry out market strategy research, optimizes the service response mechanism, and forms a strategic pattern of technology, production and market. At the same time, it constructs a multi-source fund integration model of government subsidies, enterprise investment and scientific research funds to guarantee the capital demand for collaborative innovation in each link.

4.3. Achievement transformation: full-chain implementation realizes industrialization empowerment of technology

Jereh Group has formed a full-chain achievement transformation mechanism covering R&D and design, production and manufacturing to marketing services by integrating various resources, and this mechanism has promoted the systematic transformation of form upgrading towards new quality productivity. In terms of R&D and design, relying on a high-level R&D team, the Group has completed the entire cycle from basic research to engineering verification. Through industry-university-research cooperation, it has transformed the theoretical achievements of university research institutes into applicable technical solutions, and developed seven key patent technologies that fill domestic technical gaps. In the production and manufacturing link, the Group has converted R&D achievements into standard production process schemes, and continuously optimized process

parameters through a digital intelligent control system, promoting the transformation of production methods towards intelligent manufacturing. In this process, the upgrading of equipment and processes generated by collaborative innovation has promoted the effective integration of new production factors, which not only accelerated the green development of emerging industries, but also laid a solid foundation for the long-term development of the Group. In the marketing service link, the Group has deeply integrated scientific and technological innovation achievements with the service system, forming a full-process service model including pre-sales, in-sales and after-sales services. It has optimized regional layout through precise market positioning methods, enabling collaborative innovative products to quickly gain market recognition. According to the data, by 2024, the sales revenue of the Group's high-end new products accounted for more than 50% of the total revenue. This achievement has well proved the high effectiveness of the full-chain transformation system. The construction of this system has not only improved the execution capacity of the industrial ecosystem, but also built a new source of opportunities for the Group's sustainable development in the future.

4.4. Value creation: multi-dimensional improvement achieves high-quality development of the enterprise

Relying on the mechanism of in-depth integration of government, industry, university and research, Jereh Group has comprehensively improved the core competitiveness of all links in the supply chain. This innovative cooperation model not only provides a strong guarantee for the creation and optimization of product life cycle value, but also builds an efficient operation platform for sustainable development. After forming long-term strategic cooperation with key universities and research institutes, the Group has achieved key technological breakthroughs in the intellectualization of oil and gas equipment, and formed a complete independent intellectual property system covering from core component design to whole machine integration technology, thus forming a complete control capability in key technical fields. By establishing a three-level achievement transformation system, the Group has quickly converted theoretical updates in the basic research link into engineering application technology achievements. Relying on more than 720 accumulated intellectual property rights, it has built a comprehensive protection network consisting of invention patents, utility model patents and industrial design patents, which not only provides legal support for product technological innovation, but also creates differentiated competitiveness through patent portfolio methods. The 2024 operation data shows that the Group's production efficiency has increased by 28% compared with the previous year, production costs have been reduced by 15%, and the qualified rate of its product quality has reached the industry-leading 99.8%. The Group has carried out precise market expansion measures, by optimizing the regional market layout and systematically improving the customer rating system, thus nearly doubling the net profit and continuously increasing the overall market share. The sales return has maintained a steady growth rate of more than 15% every year in the past three years. Such a development trend of simultaneous improvement in quantity and quality shows that the company's market operation plan is one of the more effective choices. The achievement of the above operating results is the result of the Group's comprehensive innovation in marketing system reconstruction, full-process customer service improvement and brand value enhancement, which in turn has generated a positive cycle of market scale growth and operating income increase.

5. Conclusions and suggestions

5.1. Research conclusions

This study takes "Demand Drive-Resource Integration-Achievement Transformation-Value Creation" as the main analysis framework, combines the practical cases of Jerih Group in the high-end equipment manufacturing industry for detailed analysis, and comprehensively explores the specific value creation paths and the underlying operation principles brought by the collaboration of government, industry, universities and research institutes to enterprises from the perspective of new quality productivity. Based on the analysis of enterprise actual operation data and innovation practices, the main conclusions are drawn as follows: From the perspective of new quality productivity, the value creation of enterprises driven by government-industry-university-research collaboration is a complex multi-link progressive process. Its key logic is to accurately lock the direction of collaborative innovation with demand as the driving force, effectively integrate various high-quality resources to achieve agglomeration, and promote the industrialization of technology and products through achievement transfer. In this process, the entire chain is interrelated and coordinated with each other to produce an interlocking overall effect.

Demand drive is the logical starting point of collaborative innovation. It relies on the macro-control of policy guidance and the micro-orientation of market traction to determine the collaborative direction in combination with the industry development trend and the company's own needs, so as to avoid the mismatch of innovation resources. Resource integration is an important supporting force for collaborative innovation. By integrating key factors of new quality productivity such as high-quality talents, cutting-edge technologies, special funds and high-quality market channels across subjects, it can effectively solve the problem of insufficient resource reserves caused by the own conditions of a single subject, and on this basis, establish the foundation for cultivating new quality productivity. Achievement transformation is the bridge connecting innovation and value creation. Improving the achievement evaluation, incentive and protection system can promote the rapid industrialization of collaborative innovation achievements, accelerate the transformation process of scientific and technological achievements from the laboratory to the market, and enable enterprises to obtain a steady stream of development momentum and unique competitiveness. As the core purpose of government-industry-university-research collaboration, Jerih Group has achieved technological breakthroughs in key fields relying on this mechanism, and built significant competitive advantage barriers through systematic patent layout. Its production efficiency has been greatly improved, operating costs have been effectively controlled, and product quality has been steadily optimized. On this basis, the enterprise's profitability has been significantly enhanced, which has further promoted the expansion of market share and the continuous improvement of comprehensive competitiveness.

5.2. Suggestions

Based on the current research process and research results, targeted operational guidance plans can be given to all participants in government-industry-university-research collaboration. Enterprises should integrate government-industry-university-research collaboration into the core strategy of cultivating new quality productivity, accurately align with industrial policy orientation and end-market demand, strengthen cooperation in core technologies, and actively establish special R&D platforms and experimental bases together with universities and research institutes. They can effectively integrate new resources through joint talent training, shared experimental equipment, and

joint technological research. Enterprises should ensure the stability of collaborative investment through various forms such as government special subsidies, industrial fund support and their own fund allocation, and form a full-process operation mechanism for the transformation link. They should clarify the ownership of achievements obtained by each participant, the proportion of profit sharing and the rules of risk sharing. The government needs to improve the collaborative innovation environment, form a differentiated support system, establish special venues for technology exchange and achievement transformation covering different regions, and guide innovation factors to move in the appropriate direction of key industries through measures such as tax reduction, subsidies for high-level talents and increased deduction ratio of R&D expenses. Universities and research institutes should strengthen in-depth connection with the industrial sector, accurately align with industrial needs to promote the industrialization of research results, balance the dual dimensions of in-depth basic research and breakthroughs in applied research, ensure that scientific research results meet the actual needs of industrial development, and take the initiative to integrate into the whole process of enterprise technological innovation. They can transform scientific research results into practical productivity through multiple paths such as cooperative R&D, proprietary technology transfer and customized technical consulting. The above measures can promote all subjects of government-industry-university-research collaboration to break down barriers, achieve in-depth integration, build an innovative ecosystem full of vitality and resilience, provide strong support for the cultivation and large-scale development of new quality productivity, and help enterprises continuously improve their value creation capacity.

5.3. Theoretical contributions

Combined with the research process and results of this study, targeted operational suggestions can be provided to all participants in government-industry-university-research collaboration. Enterprises should fully integrate government-industry-university-research collaboration into the core strategy of cultivating new quality productivity, accurately align with the direction of industrial policies and end-market demand, carry out in-depth cooperation around core technologies, and actively establish specialized R&D platforms and experimental bases together with universities and research institutes. They can effectively integrate innovation factors through joint talent training, shared experimental equipment and coordinated technological research. Enterprises should ensure the stability of collaborative investment through various forms such as government special subsidies, industrial fund support and their own fund allocation, form a full-chain achievement transformation mechanism, and clarify the ownership of achievements, profit distribution rules and risk-bearing standards of each subject. The government should improve the collaborative innovation environment, improve the policy support system at all levels, and establish application service platforms specifically for cross-regional technology exchange and achievement transfer. It should guide various innovation forces to gather in an orderly manner towards key industries through refined measures such as tax reduction, subsidies for top talents and deduction of R&D investment. Universities and research institutes should strengthen the close connection with the industrial sector, accurately align with industrial needs to promote the industrialization of research results, and from the perspectives of basic research and applied research, ensure that scientific research results conform to the actual situation of industrial development. They should actively participate in the whole process of enterprise technological innovation, and transform scientific research results into effective actionable productivity through multiple paths such as cooperative development, proprietary technology transfer and customized technical services. The above measures can promote all parties of government-industry-university-research collaboration to cross barriers, achieve in-

depth integration, create a first-class innovative ecosystem full of vitality and resilience, provide strong support for the cultivation and scale expansion of new quality productivity, and thus enable the steady growth of enterprises' value creation capacity.

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