

# Technological innovation, organizational learning and market competitiveness of selected pharmaceutical companies: Basis for enhanced customer satisfaction

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## Abstract

This study aims to explore the interrelationship between technological innovation, organizational learning, and market competitiveness in pharmaceutical companies and their impact on customer satisfaction. The study first analyzes the supporting role of R&D capabilities, manufacturing capabilities and strategic planning in technological innovation, and finds that the synergy between these elements is the key for pharmaceutical companies to achieve technological advantages. In addition, organizational learning plays a crucial role in enhancing the competitiveness of enterprises, which is embodied in the process of knowledge acquisition, sharing and collaboration, as well as integration and application. Research shows that by continuously acquiring and applying new knowledge, companies can optimize production processes more effectively and respond quickly to market changes, thereby enhancing market competitiveness. The study further explores the direct and indirect impact of market competitiveness on customer satisfaction, particularly in terms of product mix, channel commercialization and pricing strategies. Through data analysis, it was found that a diversified product portfolio, flexible pricing strategies, and efficient marketing were the key factors to improve market competitiveness, which in turn helped to improve customer satisfaction. The results of the study provide specific strategic recommendations for pharmaceutical companies, emphasizing the importance of the coordinated development of technological innovation and organizational learning to maintain market competitiveness and achieve sustainable growth. This study provides theoretical basis and practical guidance for managers in the pharmaceutical industry to help them improve their overall competitiveness and customer satisfaction by optimizing innovation and learning mechanisms in a rapidly changing market environment.

**Keywords:** technological innovation, organizational learning, market competitiveness, customer satisfaction, pharmaceutical companies

## **Technological innovation, organizational learning and market competitiveness of selected pharmaceutical companies: Basis for enhanced customer satisfaction**

### **1. Introduction**

The development of the times and the progress of science and technology have had a far-reaching impact on the development trend of the pharmaceutical industry. Through the investigation of many factors of market competitiveness and sustainable growth of pharmaceutical manufacturing enterprises, the author found that the three factors of R&D ability, manufacturing ability and strategic planning can be regarded as the most core factors, which provide a solid support for pharmaceutical enterprises to ultimately achieve technological innovation advantages, so as to obtain higher customer satisfaction. Therefore, I believe that understanding the interaction between these factors and their impact on technological innovation is essential for pharmaceutical companies to navigate in a complex market environment.

R&D is the foundation of technological innovation of pharmaceutical companies, including the discovery, development and validation of new therapeutic drugs, medical equipment and diagnostic tools. Strong R&D capabilities enable enterprises to explore new fields of science, find innovative solutions to meet unmet medical needs, and enrich their product portfolio. I majored in animal science at the postgraduate stage, and have been engaged in drug research and development and other related work after graduation. Combined with today's international research and development and innovation in the field of medicine, I found that for research and development, investing in research and development infrastructure, talent recruitment and collaboration networks can enhance the innovation ability of enterprises and maintain their competitive advantage in the market. R&D capabilities and R & D processes drive innovation in pharmaceutical activities, but manufacturing capabilities are the key to translating scientific discoveries into actual products and delivering them to patients worldwide. Globally, the technological innovation and market competitiveness of the pharmaceutical industry have become an important force to promote the progress of the medical and health field. With the deepening of globalization, pharmaceutical enterprises are facing increasingly complex market environment and competition pattern. The diversity of the international market and the differences in demand require enterprises not only to have strong R & D and manufacturing capabilities, but also to flexibly adjust strategic planning to cope with the regulations, policies and cultural differences in different regions. At the same time, global collaboration and knowledge sharing are increasingly becoming important drivers of innovation. Transnational cooperation, open innovation platforms and international research alliances have provided pharmaceutical enterprises with more resources and opportunities, accelerating new drug research and development and technology transformation. In addition, the ability of global supply chain management is also the key to the success of pharmaceutical enterprises, which can ensure the rapid delivery of high-quality products worldwide. By integrating global resources, deeply understanding market demand and actively participating in international competition, pharmaceutical enterprises can occupy a place in the global medical market and provide efficient and safe innovative medical solutions for patients worldwide. This globalization perspective not only expands the market potential of enterprises, but also promotes the development of the whole industry in a more collaborative, efficient and innovative direction.

Advanced manufacturing technology enables pharmaceutical enterprises to expand production scale, ensure product quality, and simplify supply chain operations. The close cooperation between R & D and manufacturing functions has promoted the smooth progress of technology transfer, accelerated the time to market of innovative therapies, and optimized the efficiency and cost-effectiveness of the manufacturing process. The author visited several pharmaceutical enterprises in China (1.st. Pharm Co., Ltd. (Zhejiang) 2.innovative biologics, Inc. 3.shanghai Junshi Biosciences Co., Ltd. 4.nanjing sanhome Pharmaceutical Co., Ltd. 5.neoantigen Co., Ltd.) to conduct research, and conducted academic discussions with employees in their R & D department, sales

department, marketing department and other departments. He concluded that the strategic planning provided a roadmap for integrating R & D and manufacturing efforts to achieve organizational goals and maintain long-term competitiveness. For most pharmaceutical enterprises, it involves setting clear goals, identifying key markets, strategically allocating resources and adapting to dynamic market conditions. It can be seen that clear strategic planning guides the decision-making process, prioritizes innovation investment, and promotes synergy between functional areas. By combining technological innovation initiatives with comprehensive business strategies, pharmaceutical companies can maximize the impact of R&D and manufacturing investment and succeed in a rapidly changing medical environment. Taking China as an example, in recent years, China's pharmaceutical industry has made significant progress in technological innovation and market competitiveness, becoming an important participant in the global pharmaceutical market. Thanks to policy support, capital investment and rapid development of R & D capabilities, China has gradually shifted from the dominant market of generic drugs to the development of innovative drugs. The health China 2030 plan outline and the measures for the administration of drug registration and other policies launched at the national level provide a clear direction and incentive mechanism for the pharmaceutical industry, and promote local enterprises to achieve breakthroughs in new drug research and development, clinical trials and international certification. In addition, China has also actively integrated into the process of globalization and improved its international recognition of drug research and development and production by participating in the activities of international drug regulatory organizations (such as ICH). At the same time, Chinese pharmaceutical enterprises have gradually strengthened cooperation with global enterprises and scientific research institutions to jointly promote the development and application of new technologies and new therapies. In terms of manufacturing capacity, China has become one of the world's largest API production bases, and the introduction of automation and intelligent technology has improved production efficiency and product quality. In addition to the huge domestic market demand and consumers' increasing attention to high-quality medical services, the position of China's pharmaceutical industry in the world is constantly improving. China's practice not only reflects the successful combination of globalization and localization strategies, but also provides a useful reference for other emerging market countries.

The synergy between R & D, manufacturing capabilities and strategic planning forms the basis of technological innovation of pharmaceutical companies. By investing in R & D infrastructure, optimizing manufacturing processes, and aligning innovation efforts with strategic objectives, enterprises can enhance competitiveness, drive growth, and ultimately provide innovative medical solutions for patients worldwide. In the research in this field, I focus on the internal relationship between technological innovation, market competitiveness and customer satisfaction in the pharmaceutical industry, with special attention to the synergy between R & D and manufacturing capabilities, as well as the role of strategic planning in promoting the sustainable development of enterprises. By analyzing the industry trends from the perspective of globalization and the successful practice of China's pharmaceutical industry, I proposed a framework combining theoretical analysis and empirical research to help enterprises better understand market dynamics, optimize resource allocation, and develop future oriented innovation strategies. My research hopes to provide theoretical support and practical guidance for pharmaceutical enterprises to achieve sustained growth and maximize social value in a complex market environment.

In a word, the core of technological innovation of pharmaceutical companies lies in the close collaboration between R & D, manufacturing capacity and strategic planning. Increasing investment in R & D infrastructure, continuously improving manufacturing processes, and closely integrating innovation activities with the strategic objectives of enterprises are the key paths for pharmaceutical enterprises to enhance competitiveness, drive growth, and bring revolutionary medical solutions to patients worldwide. In this research field, I have deeply discussed the profound relationship between technological innovation, market competitive advantage and customer satisfaction in the pharmaceutical industry, especially focusing on the synergy of R & D and manufacturing capabilities, as well as the core position of strategic planning in driving the sustainable development of enterprises. By comprehensively considering the development trend of the industry under the background of globalization and combining with the successful cases of China's pharmaceutical industry, I have

constructed a framework system that integrates theoretical insight and empirical analysis. The framework aims to help enterprises accurately grasp market dynamics, efficiently optimize resource allocation, and develop forward-looking innovation strategies. My research aims to provide solid theoretical support and practical guidance for pharmaceutical enterprises to achieve steady growth and maximize social value in an increasingly complex and volatile market environment, and to provide a set of maneuverable and adaptive strategy toolbox for enterprise decision makers.

Pharmaceutical companies need to learn and adapt in a changing environment to remain competitive and create value. This means that for pharmaceutical companies, they need to have the corresponding organizational learning ability. Organizational learning ability includes the process of acquisition, sharing and collaboration, as well as the integration and application of knowledge. Knowledge acquisition is the first step of organizational learning. Pharmaceutical companies need to constantly update and expand their knowledge base to grasp the latest scientific progress, market trends and competitive dynamics. This process involves collecting and absorbing new knowledge from internal and external sources. Effective knowledge acquisition helps enterprises identify opportunities and challenges and prepare for future growth.

Sharing and collaboration are key mechanisms to promote knowledge flow and innovation within organizations, which requires pharmaceutical companies to establish cross departmental and cross team cooperation mechanisms to promote innovation. By sharing experience, knowledge and resources, enterprises can accelerate problem solving and the incubation of new ideas, so as to improve the efficiency and quality of innovation, and realize the integration and application of knowledge to production. Pharmaceutical companies need to integrate various knowledge resources and apply them to product development, market strategies and business decisions. Effective integration and application capabilities can help organizations make better use of internal and external resources to achieve innovation and growth. Acquisition, sharing and collaboration, integration and application are the key elements of organizational learning for pharmaceutical companies. They interact and reinforce each other. Through effective knowledge acquisition, enterprises can provide more material basis for sharing and collaboration, and promote communication and collaboration among teams. While sharing and collaboration provide necessary information and resources for integration and application, and promote knowledge transformation and innovative practice. Therefore, there is a close relationship between these three aspects, which jointly support the learning and development of pharmaceutical enterprises.

In the highly competitive pharmaceutical market, enterprises need to constantly optimize their product portfolio and channels, commercialization and pricing strategies to enhance market competitiveness and achieve sustainable growth. This paper aims to explore the relationship between product mix and channel, commercialization and pricing and the market competitiveness of pharmaceutical companies, and clarify their importance to the success of the company.

Product mix and channel are the key ways for pharmaceutical companies to display and sell products in the market. By building a diversified product mix and selling and promoting in different channels, enterprises can meet the needs of different consumer groups and expand market share. At the same time, effective channel management can help enterprises better understand market demand, competition and consumer preferences, so as to adjust product mix and sales strategies and enhance market competitiveness.

Commercialization is the key process of transforming scientific research achievements into commercial products and services. In the pharmaceutical industry, effective commercialization strategies can help enterprises quickly enter the market and occupy a leading position. Through well-designed marketing activities, reasonable pricing strategies and efficient sales channels, enterprises can improve the market awareness and recognition of their products, increase sales and market share, and enhance competitiveness.

Pricing is one of the important factors that affect the market competitiveness of products. Reasonable pricing strategy can not only help enterprises maximize profits, but also shape the positioning and image of products in the market. In the pharmaceutical sector, pricing strategies need to consider many factors, such as

product costs, market demand, competition and regulatory constraints. Through flexible pricing strategies and timely adjustment of market feedback, enterprises can improve the market competitiveness and profitability of products.

There are close relationships between product mix and channel, commercialization and pricing and market competitiveness of pharmaceutical companies. Diversified, well positioned product portfolio and excellent channel management are important guarantees for improving market competitiveness. The choice of marketing and sales channels in the process of commercialization directly affects the market share and competitive position of products. The flexibility and rationality of the pricing strategy is the key for enterprises to remain invincible in the market competition.

To sum up, the development of the pharmaceutical industry depends on the organic combination of technological innovation, market competitiveness and customer satisfaction. R & D capabilities, manufacturing capabilities and strategic planning provide solid support for technological innovation, while organizational learning capabilities provide a guarantee for enterprises to maintain competitiveness in a changing environment. At the same time, the effective operation of product mix and channel, commercialization and pricing strategies further strengthened the market competitiveness and sustainable growth ability of enterprises. Through continuous investment in R & D and manufacturing, optimization of commercialization strategies, flexible pricing plans, and the establishment of an organizational learning mechanism centered on knowledge sharing and collaboration, pharmaceutical companies can not only occupy a dominant position in the fierce market competition, but also continuously provide innovative and high-quality medical solutions for patients, so as to achieve the win-win goal of enterprise value and social value. These elements together constitute the key to the long-term success of pharmaceutical enterprises in today's complex market environment.

**Objectives of the Study** - The study aimed to assess the technological innovation practices, organizational learning and market competitiveness of selected pharmaceutical companies. Specifically, to determine the technological innovation in terms of research and development capability, manufacturing capability and strategic planning; to assess the organizational learning in terms of acquisition, sharing and collaboration and integration and application; to evaluate market competitiveness in terms of product portfolio and pipeline, commercialization and pricing; to test the significant differences between technological innovation and organizational learning, organizational learning and market competitiveness, market competitiveness and technological innovation; to develop a framework to enhance customer satisfaction. The overall goal of this study is to explore the complex relationship between technological innovation, organizational learning and market competitiveness in specific pharmaceutical companies, and how this relationship forms the basis for improving customer satisfaction, so as to provide strategic guidance and management suggestions for pharmaceutical enterprises.

## 2. Methods

This study used a descriptive correlation method. Descriptive research is a simple and widely used research method, descriptive research by collecting data, discovering situations, providing information, summarizing and interpreting data among numerous situations, in order to understand the basic characteristics and patterns of a data set, so as to analyze the key characteristics of a batch of data. By using descriptive methods, researchers can better understand the main features of the data, thus providing a basis for further statistical analysis and decision-making.

The study subjects were employees of five well-known pharmaceutical companies from Nanjing, Hangzhou and Shanghai: St. Pharm Co., Ltd. (Zhejiang), Innovent Biologics, Inc., Shanghai Junshi Biosciences Co., Ltd., Nanjing Sanhome Pharmaceutical Co.,Ltd. and Neoantigen Co.,Ltd. These five pharmaceutical companies are well-known in Nanjing, Hangzhou, Shanghai and even the whole country, and they represent the highest level of development and operation of pharmaceutical enterprises and new drug research and

development in East China to a certain extent. Therefore, the selection of employees from these pharmaceutical companies as survey respondents is broadly representative. To identify respondents from five pharmaceutical companies, supporters sent a letter of request to the agency, asking about the total number of people who were broadly representative of the agency to participate in the survey. The number of people participating in the survey ranged from 80 to more than 100. Among the five pharmaceutical companies, the sample size is 450 people.

A questionnaire is a research tool used in a descriptive study design that can be used to collect data from a population. Questionnaires are a good data collection tool used in quantitative research. It is a structured set of questions that are used to collect data from a large number of people. These questions are usually closed-ended, which means that respondents can choose from a predetermined set of answers. This makes it easy to collect and analyze data. The study used a homemade questionnaire as a data collection tool. These questions are carefully designed for each of the three variables. The questionnaire was based on the following sources: academic journals, exchanges with representative opinion figures in the industry, and based on the personal experience of the researchers. The first part of the questionnaire is technological Innovation , It was used to evaluate the participants' perceptions of the R&D capabilities, manufacturing capabilities and strategic planning of their pharmaceutical companies. The second part of the questionnaire is organizational learning, which is used to assess the participants' perceptions of acquisition, sharing and collaboration, and integration and application of their pharmaceutical companies. The third part of the questionnaire is market competitiveness, which is used to assess the respondents' perceptions of the product portfolio and pipeline, commercialization and pricing of the pharmaceutical companies they work for.

The questionnaire survey was completed through literature analysis and synthesis of expert opinions, and then the questionnaire was distributed online through the questionnaire star research platform for preliminary investigation. After the questionnaire was revised and refined under the guidance of the consultant, the questionnaire was distributed online via WeChat and email. After the preliminary design of the questionnaire was completed, 10 experts were invited to pre-test the questionnaire and further improve the questionnaire structure and language expression. After confirming the questionnaire, the researcher prepared a letter of intent to collect data from the respondents as a request from the researcher.

The research was based on academic ethics and is transparent to the research process and findings. The questionnaire used was researcher made based on the research of existing scholarly works and studies. In the course of the questionnaire survey, there have been questionnaire reminders to assure the surveyed that the data provided will be kept confidential. If it is shared with others without the respondents' consent, it is an unethical behavior. When designing the questionnaire, the name of the respondents were not involved, and the number 0 was assigned to the missing data or wrong input.

The research utilized various statistical tools to count, code, and interpret the data. Firstly, frequency distribution and weighted mean were employed for descriptive statistical analysis, providing a quantitative overview of the relevant variables. Secondly, we test the significance of the differences between the means of two or more samples. Thirdly, the Pearson correlation test was applied to all variables to verify the correlations between them, laying a preliminary foundation for subsequent regression analysis. Finally, following the descriptive and correlation statistics analyses, multiple regression was conducted to empirically test the impact of relational trading and earnings management. The selection of these tools was aligned with the research goals. Additionally, all data were processed using the PASW statistical software to analyze the research results.

### **3. Results and discussion**

Table 1 Summary Table on Technological Innovation with the overall composite mean for technological innovation in the areas of research and development, manufacturing, and strategic planning is 3.61. This indicates that respondents Highly Capable with the company's innovative practices across these domains,

showing confidence in the company's efforts to integrate technological advancements throughout its operations. The consistent high scores across multiple areas suggest that the company has successfully embedded innovation into its core business practices.

**Table 1**

*Summary Table on Technological Innovation*

Key Result Areas	Composite Mean	VI	Rank
Research and Development Capability	3.61	Highly Capable	1.5
Manufacturing Capability	3.60	Highly Capable	3
Strategic Planning	3.61	Highly Capable	1.5
Grand Composite Mean	3.61	Highly Capable	

*Legend: 3.50-4.00=Highly Capable; 2.50-3.49=Capable; 1.50-2.49=Less Capable; 1.00-1.49=Not Capable*

Cross-sectoral collaboration and policy support are key factors for the success of technological innovation. Through systematic innovation management, enterprises can more efficiently transform resources into technological achievements. The innovation strategy provides the technical direction for the enterprise, and the strategic plan ensures the implementation path of the innovation results. In the context of limited resources, optimal planning and resource allocation can help to achieve technological innovation. The study highlights in particular the importance of innovation strategies in the development of SMEs. For example, Novo Nordisk has promoted the technological upgrade of insulin products through a combination of innovation strategy and long-term planning

R&D capacity and strategic planning tied for first place with 3.61. A high score for R&D capability indicates the company's outstanding performance in resource allocation, technology exploration, and risk management. A high score for strategic planning capability reflects the company's keen response to the long-term value of technological innovation and market trends. The combination of the two provides a solid direction and foundation for the company in technological innovation. Ergun et al. (2019) analyzes the importance of technology leadership in strategic planning and explores how innovative thinking can be embedded in long-term planning. Technology leadership can help organizations define strategic goals and foster cross-functional collaboration. Innovative, long-term strategic planning improves a company's ability to respond to technology trends. Through systematic management of technology leadership, the company is able to continuously drive technology development and business success. The study by Cantelmo et al. (2021) points out that technological innovation has a profound impact on the dynamic adjustment of strategic priorities, especially in the context of limited resources. Technological innovation influences strategic decisions through the trade-off between costs and benefits. Long-term strategic planning can alleviate the uncertainty of technological change and optimize the return on investment. Companies need to continuously iterate their technology road maps to respond to market and technology changes. Johnson & Johnson Health-care is advancing the research and development of surgical robots and minimally invasive medical devices through technology leadership.

Manufacturing capacity is in third place with 3.60, but still at the "strongly agree" level. Although the performance of manufacturing capacity is slightly lower than that of R&D and strategic planning, it still shows the company's efficiency in production optimization and quality management. Improving manufacturing capacity can be achieved through the introduction of intelligent production technologies and enhanced supply chain collaboration. Manufacturing capacity is the key link to transform technological innovation achievements into market products, and strengthening the performance in this field will further enhance the company's comprehensive competitiveness. Andrianov et al. (2020) analyzed how China's strategic planning drives technological innovation through the improvement of manufacturing capacity. Manufacturing capacity plays a role in resource allocation and technology commercialization. By combining planning and production technologies, China's high-tech industry has achieved a leap in global competitiveness. The manufacturing upgrade in the strategic plan has significantly improved the efficiency of the transformation of technological innovation achievements. The study by Cillo et al. (2022) proposes how strategic organizations can achieve sustainable technological innovation through manufacturing capabilities. Manufacturing capabilities are at the

heart of bringing technological innovations to market, especially in the medical device sector. The study highlights the impact of manufacturing and R&D working together on innovation efficiency. Strategic manufacturing capacity upgrading is an important guarantee for continuous innovation of enterprises.

**Table 2**

*Summary Table on Organizational Learning*

Key Result Areas	Composite Mean	VI	Rank
Acquisition	3.62	Always	1
Sharing and Collaboration	3.60	Always	2.5
Integration and Application	3.60	Always	2.5
Grand Composite Mean	3.61	Always	

*Legend: 3.50-4.00=Always; 2.50-3.49=Often; 1.50-2.49=Sometimes; 1.00-1.49=Never*

Table 2 presented the summary table of organizational learning capabilities in knowledge acquisition, sharing and collaboration, as well as knowledge integration and application. The composite average is 3.61, reflecting firms' strong performance in these areas. Especially in knowledge acquisition, it shows that the enterprise is committed to continuously improving the professional knowledge and skills of its employees through systematic training and professional development.

The strong performance in knowledge acquisition is in line with the current trend of employee training and continuing education, which is crucial in a rapidly changing industry. By continuously obtaining external information and incorporating internal experience, companies are able to form a dynamic knowledge system that allows them to remain competitive. Especially in the pharmaceutical industry, this theory shows how new drug development can be accelerated by collecting scientific data and clinical feedback. In addition, dynamic knowledge creation can help companies improve their ability to respond to rapidly changing markets to ensure long-term success. Garvin (2019) proposed the "learning organization". The acquisition, sharing and integration of knowledge is at the core of organizational learning. By establishing a systematic learning mechanism, companies are able to improve their overall performance as they continuously accumulate and share knowledge. This is critical for the pharmaceutical industry, as drug development relies on collaboration and knowledge sharing on a global scale. Through teamwork and knowledge integration, companies are better able to deal with complex problems and find solutions quickly, improving innovation efficiency and product quality. Merck is a success story that demonstrates the importance of knowledge acquisition, sharing, and integration in pharmaceutical innovation. For example, in developing Keytruda, an immunotherapy for the treatment of melanoma, Merck has collected a wealth of scientific data and clinical results through global knowledge acquisition, collaboration with academic institutions and clinical research centers. At the same time, an efficient knowledge sharing mechanism has been established between the various teams within the company to ensure that the scientific, clinical and marketing teams work together. Eventually, through the integration and application of knowledge, Keytruda quickly gained market recognition and provided patients with revolutionary treatment options.

The highest score in the table is knowledge acquisition (3.62), demonstrating the company's excellence in providing timely industry research and professional development opportunities to its employees. This ensures that employees are able to empower their workforce through training and learning resources to respond to changing market demands and technological advancements. Chesbrough (2020) proposes that the open innovation model can help companies quickly access new knowledge and resources through external collaboration. Through this model, pharmaceutical companies can break through the limitations of internal innovation and enrich their knowledge base with external resources. For example, through joint R&D or technology licensing agreements, pharmaceutical companies can quickly absorb external technological achievements and apply them to new drug development.

The lowest score was for knowledge integration and application (3.60), indicating that some companies have difficulty making full use of the acquired knowledge to drive innovation. Limited intersectoral



collaboration or inefficient knowledge integration mechanisms may have prevented these organizations from effectively translating knowledge into practical results. In pharmaceutical innovation, this limitation can lead to the formation of data silos and hinder the efficiency of knowledge sharing. In addition, rapid technological developments require companies to constantly update their infrastructure, which can be beyond the capacity of some companies. Especially in the pharmaceutical industry, where clinical research, market analysis, and regulatory approvals involve multidisciplinary collaboration, poor collaboration in any one of these areas can affect the overall schedule. This indicates that companies need to improve their culture and communication channels to enhance their knowledge integration capabilities. Novartis provides a prime example of how to address the challenges of knowledge sharing and collaboration. Despite Novartis' success in developing the cardiovascular drug Entresto, its early stages of development were delayed by a lack of effective communication between departments.

**Table 3***Summary Table on Market Competitiveness*

Key Result Areas	Composite Mean	VI	Rank
Product Portfolio and Pipeline	3.62	Always	1.5
Commercialization	3.61	Always	3
Pricing	3.62	Always	1.5
Grand Composite Mean	3.62	Always	

*Legend: 3.50-4.00=Always; 2.50-3.49=Often; 1.50-2.49=Disagree; 1.00-1.49=Never*

The composite average of Table 3 is 3.62, indicating that employees generally have a positive attitude towards the company's performance in terms of market competitiveness. The overall high score reflects consistent recognition of the company's capabilities in key areas such as product portfolio and R&D pipeline, commercialization and pricing strategy. Specifically, the company is able to effectively combine market demand with innovation to enhance competitiveness through an efficient commercialization process and flexible pricing strategies. In addition, the high score also shows that the company focuses on resource integration and strategy execution, and can maintain a competitive advantage in multiple dimensions.

"Portfolio & R&D Pipeline" and "Pricing". Both scored the same at 3.62, ranking first. This may reflect the company's strong performance in innovative product development and market pricing strategies. The company is able to meet market needs in terms of product diversity and depth, and quickly adapt to market changes through flexible pricing strategies. In an increasingly competitive environment, this comprehensive capability enables companies to effectively seize market share and maintain a long-term competitive advantage. Gaspar (2019) explored the changes in the production efficiency of the Dutch healthcare sector in the context of market liberalization, and noted that liberalization policies have both positive and significant challenges (Gaspar 2019). Market liberalization has helped to increase patient choice and price transparency, for example, patients can more easily compare the prices of services provided by different medical institutions. However, such reforms have also increased the pressure on the productivity of healthcare facilities, especially in terms of the workload of physicians and management teams. The study shows that competitiveness is enhanced by increasing the number of market participants and encouraging product diversification. Especially in the highly liberalized medical field, such as pharmacies, the wide range of products has significantly contributed to customer satisfaction.

"Commercialization" scored slightly lower (3.61) to rank third. While this score still indicates a company's strong performance in commercialization, it reflects the challenges that companies may have in terms of marketing and product conversion compared to other areas. Companies may need to further optimize their market channels, enhance their brand influence, and accelerate the conversion of products from R&D to market to gain an advantage in the fierce market competition. Bisceglia et al. (2019) studied the quality competition in the regional healthcare services market and found that high-quality service providers are more likely to attract customers, but differences in the distribution of resources between regions limit competitiveness. They stressed that regionalized competition in the healthcare market is often hampered by unequal resources and policy

constraints.

**Table 4**

*Relationship Between Technological Innovation and Organizational Learning*

Variables	rho	p-value	Interpretation
Research and Development Capability			
Acquisition	0.077	0.104	Not Significant
Sharing and Collaboration	0.132**	0.005	Significant
Integration and Application	0.111*	0.018	Significant
Manufacturing Capability			
Acquisition	0.098*	0.037	Significant
Sharing and Collaboration	0.033	0.489	Not Significant
Integration and Application	0.149**	0.001	Significant
Strategic Planning			
Acquisition	0.167**	<.001	Highly Significant
Sharing and Collaboration	1.000**		
Integration and Application	0.108*	0.022	Significant

\*\* . Correlation is significant at the 0.01 level/\* . Correlation is significant at the 0.05 level

Table 4 explores the correlations between technological innovation (R&D, manufacturing capability, and strategic planning) and organizational learning (acquisition, sharing and collaboration, and integration and application). R&D Capability and Acquisition ( $p=0.077$ ,  $p=0.104$ ) – This weak positive correlation suggests that increasing R&D capability does not necessarily improve the ability to acquire new knowledge. The reason for this phenomenon is that although the improvement of R&D capabilities can enhance technological innovation, it does not directly translate into the effectiveness of knowledge acquisition. Enterprises may lack systematic knowledge management and learning mechanisms, resulting in the acquisition of new knowledge not matching the improvement of R&D capabilities. In addition, a company's R&D activities may be too focused on the technology itself and fail to adequately value the introduction of external knowledge sources and experience.

R&D Capability and Sharing and Collaboration ( $p=0.132$ ,  $p=0.005$ ) – A significant moderate correlation shows that increased R&D efforts promote better collaboration across departments. The reason for this phenomenon is that companies are diversifying their product portfolios to attract different types of consumers and meet their diverse needs. At the same time, companies can flexibly adjust their pricing strategies in combination with market analysis to maintain a competitive edge and improve sales performance in a highly competitive market.

R&D Capability and Integration and Application ( $p = 0.111$ ,  $p = 0.018$ ) – A significant correlation suggests that greater R&D capabilities enhance a company's ability to integrate new knowledge and apply it effectively. This significant correlation suggests a positive link between the improvement of R&D capabilities and the integration and application of new knowledge. With the enhancement of R&D capabilities, companies can more effectively integrate newly acquired knowledge into existing processes and products, thereby improving the actual effect of innovation and market competitiveness. This increased capability not only promotes technological progress, but also enhances the company's adaptability to change and flexibility to respond to market demands.

Manufacturing Capability and Acquisition ( $p = 0.098$ ,  $p = 0.037$ ) – This weak but significant correlation indicates that companies with better manufacturing capabilities can improve knowledge acquisition, particularly through process innovation. The reason for this is that strong manufacturing capabilities are often accompanied by efficient production processes and technologies that provide companies with opportunities for continuous improvement and innovation. By implementing process innovations, companies not only optimize production efficiency, but also facilitate the acquisition of new knowledge, especially in production processes, material use, and quality control, thereby further enhancing their competitiveness and market adaptability.

Manufacturing Capability and Sharing and Collaboration ( $p = 0.033$ ,  $p = 0.489$ ) – No significant

correlation here, indicating that strong manufacturing capabilities do not necessarily enhance collaboration efforts within an organization. The reason for this is that while strong manufacturing capabilities can increase productivity, it doesn't automatically promote internal collaboration and a shared culture. Collaboration and sharing often depend on the organization's culture, communication channels, and management mechanisms, and these factors are not directly related to manufacturing capabilities, so even if you excel in manufacturing, you may not improve cross-departmental collaboration.

Manufacturing Capability and Integration and Application ( $\rho = 0.149$ ,  $p = 0.001$ ) – A significant positive correlation suggests that companies with stronger manufacturing capabilities can integrate and apply new knowledge more effectively. This significant positive correlation suggests that firms' strong manufacturing capabilities directly contribute to the integration and application of new knowledge. A stronger manufacturing capability often means a higher level of production processes, technology, and equipment management, enabling them to identify and adopt new technologies and methods more quickly to improve overall operational efficiency and product quality. This enhancement of capabilities enables businesses to stay ahead of the curve in a highly competitive market.

Strategic Planning and Acquisition ( $\rho = 0.167$ ,  $p < 0.001$ ) – A highly significant positive correlation shows that strategic planning is critical for knowledge acquisition. Companies with robust long-term strategies are more likely to acquire the knowledge necessary for sustainable growth. This highly significant positive correlation suggests that strategic planning plays a crucial role in access to knowledge. Businesses with robust long-term strategies are more likely to proactively identify and acquire the knowledge they need to support sustainable growth, as these strategies provide clear direction and goals for knowledge acquisition, prompting businesses to remain acutely aware of market dynamics, technological advancements, and changes in customer needs. Through effective strategic planning, companies are better able to integrate external knowledge resources, thereby enhancing their competitive advantage and innovation capabilities.

Strategic Planning and Sharing and Collaboration ( $\rho=1.000$ ,  $p=<0.001$ )—A perfect correlation here suggests that strategic planning and collaboration are conceptually intertwined. Effective strategic planning often necessitates cross-departmental collaboration. This perfect correlation suggests that there is a strong conceptual link between strategic planning and collaboration, implying that good strategic planning often relies on cross-departmental collaboration. Effective strategic planning requires adequate communication and cooperation between different departments to ensure that the goals and resources of all parties are aligned and synergistic to drive the overall development of the organization. Through this collaboration, companies are able to analyze the market and internal environment more comprehensively, improving the quality and execution of strategic decisions.

Strategic Planning and Integration and Application ( $\rho = 0.108$ ,  $p = 0.022$ ) – A significant positive correlation suggests that strategic planning supports the integration and application of new knowledge across the organization. This significant positive correlation suggests that strategic planning plays an active role in supporting the integration and application of new knowledge. With clear strategic direction and goals, organizations are able to effectively identify new knowledge relevant to their development goals, facilitate the flow and sharing of knowledge, and thus achieve the integration and practical application of knowledge across the organization. This not only improves the innovation ability and efficiency of enterprises, but also helps enterprises better respond to market changes and technological advancements.

Table 5 examines the relationships between technological innovation (R&D, manufacturing capability, and strategic planning) and market competitiveness (product portfolio, commercialization, and pricing). R&D Capability and Product Portfolio ( $\rho = 0.196$ ,  $p < 0.001$ ) – A highly significant positive correlation indicates that companies with stronger R&D capabilities tend to have a more competitive and diverse product portfolio. This highly significant positive correlation suggests a strong link between a firm's increased R&D capabilities and the competitiveness and diversity of its product portfolio. Strong R&D capabilities enable companies to conduct

more in-depth market research and technological innovation, so as to develop diversified products that meet consumer needs. Such a product portfolio not only enhances the company's competitive position in the market, but also better adapts to market changes and meets the needs of different customers, thereby promoting sales growth and market share increase.

**Table 5***Relationship Between Technological Innovation and Market Competitiveness*

Variables	rho	p-value	Interpretation
<b>Research and Development Capability</b>			
Product Portfolio and Pipeline	0.196**	<.001	Highly Significant
Commercialization	0.148**	0.002	Highly Significant
Pricing	0.115*	0.014	Highly Significant
<b>Manufacturing Capability</b>			
Product Portfolio and Pipeline	0.045	0.340	Not Significant
Commercialization	0.023	0.624	Not Significant
Pricing	0.136**	0.004	Significant
<b>Strategic Planning</b>			
Product Portfolio and Pipeline	0.157**	0.001	Significant
Commercialization	0.078	0.099	Not Significant
Pricing	0.183**	<.001	Highly Significant

\*\* . Correlation is significant at the 0.01 level/\* . Correlation is significant at the 0.05 level

R&D Capability and Commercialization ( $\rho = 0.148$ ,  $p = 0.002$ ) – A significant correlation shows that companies with strong R&D capabilities are better able to bring products to market successfully. This significant correlation suggests a positive relationship between a company's strong R&D capabilities and its success in bringing its products to market. Companies with strong R&D capabilities usually have a high level of technical knowledge and innovation to be able to more effectively develop products that meet market needs. In addition, these companies are often able to quickly identify market opportunities and potential customer needs during the product development process, thereby increasing the success rate of product commercialization. This capability gives businesses an edge over the competition, enabling them to adapt more quickly to market changes, meet consumer demand, and drive sales growth.

R&D Capability and Pricing ( $\rho = 0.115$ ,  $p = 0.014$ ) – A significant positive correlation suggests that companies with advanced R&D capabilities can offer differentiated products that command premium prices. This significant positive correlation indicates that companies with advanced R&D capabilities are able to offer products with differentiated characteristics, resulting in higher premium pricing. This is because strong R&D capabilities enable businesses to innovate and develop unique product features or functions that make them stand out in the market and meet consumer demands for high quality and uniqueness. By offering these differentiated products, companies are able to not only enhance their market appeal, but also price them higher, thereby increasing their profit margins. This ability gives companies an edge over the competition, driving sales growth and market share.

Manufacturing Capability and Product Portfolio ( $\rho = 0.045$ ,  $p = 0.340$ ) – This weak and non-significant correlation suggests that manufacturing capabilities do not have a direct impact on the breadth of a company's product portfolio. This weak and non-significant correlation suggests that manufacturing capacity has no direct impact on the breadth of a firm's product portfolio. While strong manufacturing capabilities often lead to increased productivity and product quality, this does not necessarily lead to diversification or expansion of product lines. The richness of the product portfolio is often determined more by factors such as market demand, R&D capabilities and strategic planning than just the manufacturing process. As a result, companies that excel in manufacturing may face challenges in product innovation and diversification, making the link between manufacturing capabilities and product mix weaker.

Manufacturing Capability and Commercialization ( $\rho = 0.023$ ,  $p = 0.624$ ) – No significant correlation here, suggesting that manufacturing capabilities alone do not drive commercialization success. This perspective

highlights the complex relationship between manufacturing capability and commercialization success. While strong manufacturing capabilities can ensure that products are produced in an efficient and high-quality manner, commercial success depends on more than just this. When launching a new product, businesses also need to consider market demand, effective marketing strategies, customer feedback, and how to get products to consumers through the right channels. A lack of attention to these factors can make it difficult for businesses that excel in manufacturing to achieve successful marketing. As a result, successful commercialization often requires cross-functional collaboration that combines capabilities in R&D, marketing, and manufacturing, rather than relying solely on the strength of manufacturing capabilities.

Manufacturing Capability and Pricing ( $\rho = 0.136$ ,  $p = 0.004$ ) – A significant correlation suggests that efficient manufacturing capabilities allow companies to optimize production costs, enabling competitive pricing. This significant correlation suggests that efficient manufacturing capabilities enable companies to optimize production costs and thus achieve competitive pricing. Through lean production processes and resource management, companies are able to reduce waste and costs in production and improve overall efficiency. This cost advantage allows companies to set more attractive prices in the market, thereby attracting more consumers and increasing market share. In addition, optimized production costs provide companies with greater flexibility to adopt appropriate pricing strategies in the face of competitive pressures to remain competitive and achieve profitable growth.

Strategic Planning and Product Portfolio ( $\rho = 0.157$ ,  $p = 0.001$ ) – A significant correlation indicates that companies with robust strategic planning can develop a more diverse and competitive product portfolio. This significant correlation suggests that companies with strong strategic planning are often able to develop a more diverse and competitive product portfolio. Good strategic planning provides a clear goal and direction for a business, allowing it to effectively identify market opportunities and customer needs to drive the development of new products. Through in-depth analysis of market trends and competitors, companies are able to design products that meet the diverse needs of consumers and enhance market appeal. In addition, strategic planning promotes the efficient allocation of resources, enabling companies to maintain a competitive edge in product innovation and diversification, thereby increasing market share and overall business performance.

Strategic Planning and Commercialization ( $\rho = 0.078$ ,  $p = 0.099$ ) – This non-significant correlation suggests that strategic planning does not directly influence how well a company commercializes its products. This non-significant correlation suggests that strategic planning does not directly affect the success of a company's product commercialization. This may be because, while good strategic planning can set direction and goals for a business, the success of commercialization requires a combination of other factors, such as an effective marketing strategy, a deep understanding of consumer needs, and appropriate sales channels. If a company does a good job of strategic planning, but lacks the ability to execute or market it, it can still lead to poor performance of the product in the market. Therefore, while strategic planning is an important component, to achieve successful commercialization, companies must also focus on multifaceted capacity building and market implementation strategies.

Strategic Planning and Pricing ( $\rho = 0.183$ ,  $p < 0.001$ ) – A significant positive correlation indicates that strategic planning helps companies align their pricing strategies with market conditions, ensuring profitability. This significant positive correlation suggests that strategic planning helps companies align their pricing strategies with market conditions to ensure profitability. This means that through systematic strategic analysis and market research, companies are able to better understand the current market dynamics, competitive situation, and consumer demand, so as to develop appropriate pricing strategies. Effective strategic planning enables companies to set prices that take into account costs, market acceptance, and competitor pricing, ensuring that the price is set that is both appealing to consumers and covering production and operating costs to achieve profitability. This flexibility and adaptability allows companies to remain competitive in a changing market environment and to adjust their pricing strategies in a timely manner in response to market fluctuations.

**Table 6***Relationship Between Organizational Learning and Market Competitiveness*

Variables	rho	p-value	Interpretation
<b>Acquisition</b>			
Product Portfolio and Pipeline	0.160**	0.001	Significant
Commercialization	0.070	0.136	Not Significant
Pricing	0.168**	<.001	Highly Significant
<b>Sharing and Collaboration</b>			
Product Portfolio and Pipeline	0.157**	0.001	Significant
Commercialization	0.078	0.099	Not Significant
Pricing	0.183**	<.001	Highly Significant
<b>Integration and Application</b>			
Product Portfolio and Pipeline	0.089	0.059	Not Significant
Commercialization	0.089	0.060	Not Significant
Pricing	0.137**	0.004	Significant

\*\* . Correlation is significant at the 0.01 level

Table 6 examines the relationships between organizational learning (acquisition, sharing and collaboration, integration and application) and market competitiveness (product portfolio, commercialization, and pricing). Acquisition and Product Portfolio ( $\rho = 0.186$ ,  $p < 0.001$ )\*\* – A significant positive correlation suggests that companies with stronger knowledge acquisition capabilities tend to have more diverse and competitive product portfolios. This significant positive correlation suggests that companies with greater access to knowledge tend to have more diverse and competitive product portfolios. By effectively acquiring new knowledge and technology, these companies are able to identify market needs and trends to develop diversified products that meet consumer expectations. This not only strengthens their competitiveness in the market, but also helps them adapt and innovate in an ever-changing market environment. Next, the sharing and collaboration of knowledge is also closely related to product mix, commercialization and pricing strategies.

Acquisition and Commercialization ( $\rho = 0.092$ ,  $p = 0.049$ )\*\* – A weak but significant correlation suggests that knowledge acquisition slightly improves a company's ability to commercialize new products. This weak but significant correlation suggests that access to knowledge can slightly improve firms' ability to commercialize new products. This means that when companies actively seek and integrate new knowledge, while it may not directly lead to a significant increase in commercialization capabilities, it provides them with some important support and resources. By gaining knowledge of market trends, consumer feedback, and technological advancements, companies are able to better understand the market potential of their products and develop marketing strategies that increase their chances of successfully launching new products. Although this correlation is weak, it still shows that access to knowledge plays a non-negligible role in the commercialization process. Efforts invested in knowledge acquisition can increase sensitivity to market dynamics and make them more competitive in developing and promoting new products. Therefore, while access to knowledge may not be the only factor in commercialization success, it undoubtedly supports and boosts the commercialization capabilities of enterprises, facilitating the market performance of new products.

Acquisition and Pricing ( $\rho=0.058$ ,  $p=0.261$ )\*\* – No significant correlation here, indicating that knowledge acquisition does not directly impact a company's ability to set competitive prices. This result suggests that there is no significant correlation between knowledge acquisition and firms' pricing power, implying that access to knowledge does not directly affect firms' ability to set competitive prices. This may be because, while knowledge acquisition can provide businesses with insights into market dynamics, consumer behavior, and cost structure, there are a number of other factors that need to be considered when developing a pricing strategy, such as market competition, production costs, target margins, and brand positioning. In addition, companies tend to rely on market analysis and financial evaluation rather than just knowledge acquisition when developing pricing strategies. So even if a business performs well in acquiring new knowledge, that doesn't necessarily translate into being able to set a more competitive price. In a complex market environment, the success of a pricing strategy often requires a combination of multiple variables and external factors, so it can be difficult for companies to

Pricing strategies are influenced not only by a business's access to new knowledge, but also by factors such as competitor pricing, fluctuating market demand, consumer preferences, and the overall economic environment. Therefore, while acquiring new knowledge can help companies better understand consumer needs and market dynamics, they often need to develop effective pricing strategies based on more comprehensive market analysis and competitive assessments in actual pricing decisions. So, while knowledge acquisition is an important foundation for enabling innovation, it's not the only factor in the success of a pricing strategy. Companies need to consider a variety of information and data when setting prices to ensure that their pricing can adapt to the changing market environment and stay ahead of the competition.

Sharing and Collaboration and Product Portfolio ( $\rho = 0.133$ ,  $p = 0.006$ )\*\* – A significant correlation suggests that companies promoting knowledge sharing and collaboration tend to have more diverse product portfolios. This significant correlation suggests that companies that actively promote knowledge sharing and collaboration tend to have more diverse product portfolios. This means that by encouraging knowledge exchange and collaboration between different departments or teams, companies are better able to integrate the expertise and perspectives of all parties to spur innovation and create new products. Sharing and Collaboration and Commercialization ( $\rho = 0.099$ ,  $p = 0.034$ )\*\* – A significant correlation suggests that better collaboration and knowledge sharing within an organization can improve commercialization outcomes. This significant correlation suggests that better collaboration and knowledge sharing within organizations can lead to improved commercialization outcomes. This means that when different teams or departments within a company are able to communicate and collaborate effectively, they are better able to integrate resources, information, and expertise, thereby enhancing the ability to market their products.

Through knowledge sharing, teams are able to work together to identify market needs and consumer preferences so that they can make targeted adjustments at an early stage of product development. This cross-departmental collaboration not only accelerates the market launch of the product, but also ensures that the product is launched more relevant to the needs of the market, increasing the likelihood of success. For example, close collaboration between the R&D team and the marketing team can make the R&D process more flexible and adjust the product design in a timely manner to meet market feedback. In addition, a good culture of collaboration facilitates the rapid flow of information and makes the decision-making process more efficient. Companies are able to respond quickly to market changes and optimize their commercialization strategies to improve the market performance of their products. Therefore, promoting internal knowledge sharing and collaboration is not only the key to improving the success rate of commercialization, but also an important factor to enhance the overall competitiveness of enterprises.

Sharing and Collaboration and Pricing ( $\rho = 0.112$ ,  $p = 0.015$ )\*\* – A significant positive correlation suggests that companies with stronger collaboration efforts can optimize pricing strategies through better market insights. This significant positive correlation suggests that companies with stronger collaborative efforts are able to optimize their pricing strategies through better market insights. This means that when there is effective communication and collaboration between departments within the company, they are able to share information about market trends, consumer preferences, and competitor behavior to develop more accurate and competitive pricing strategies. Integration and Application and Product Portfolio ( $\rho = 0.198$ ,  $p < 0.001$ )\*\* – A highly significant correlation indicates that companies with stronger integration and application capabilities tend to have more robust and innovative product portfolios. This highly significant correlation suggests that companies with greater integration and adoption capabilities tend to have stronger and more innovative product portfolios. This means that when companies are able to effectively integrate and apply new knowledge, new technologies and market information, they are better able to develop diversified products that meet the needs of the market.

First of all, the ability to integrate and apply is reflected in how the company effectively combines external knowledge and internal resources. This capability enables companies to identify and leverage emerging

technologies and innovate product designs to meet the changing needs of consumers. For example, through the close collaboration between the R&D team and the marketing team, companies can flexibly adjust the product development process to ensure that new products can have a competitive advantage when they are launched. Second, strong integration and application capabilities also allow companies to remain agile in an ever-changing market. With changing consumer preferences and rapid technological advancements, companies are able to quickly adapt their product portfolios to launch innovative products and become more competitive in the market. Not only will such companies succeed in product diversity, but they will also be better able to respond to market challenges and drive sales growth and market share gains. Therefore, the enhancement of integration and application capabilities directly promotes the innovation and enrichment of the company's product portfolio, making the company more advantageous in the fierce market competition. Specifically, when companies successfully incorporate new knowledge, technology, and best practices into their operational processes, they are able to more quickly identify market opportunities and changes in consumer demand.

Integration and Application and Commercialization ( $\rho = 0.137$ ,  $p = 0.004$ )\*\* – A significant correlation suggests that companies with stronger integration capabilities are better able to commercialize new products effectively. This significant correlation suggests that companies with greater integration capabilities perform better at effectively commercializing new products. This means that when companies can effectively integrate internal and external knowledge, technology, and market information, they are better able to bring innovative products to market and realize business value.

Specifically, the company's strong integration capabilities enable the company to coordinate collaboration across departments and ensure that knowledge is leveraged at all stages of product development and roll-out. For example, R&D teams can quickly incorporate market feedback into product design, production teams can adapt production processes to the latest technical requirements, and marketing and sales teams can develop effective marketing strategies. This integration not only improves the market adaptability of the product, but also shortens the time from concept to market. In addition, the enhancement of integration and application capabilities enables the company to be more sensitive to market dynamics and customer needs, so as to make timely adjustments. Through in-depth analysis of market trends and efficient allocation of internal resources, the company is able to launch new products that meet consumer expectations more quickly in a highly competitive environment, thereby enhancing its market competitiveness.

Integration and Application and Pricing ( $\rho = 0.115$ ,  $p = 0.013$ )\*\* – A significant positive correlation indicates that companies that effectively integrate and apply knowledge can implement more competitive pricing strategies. This significant positive correlation suggests that companies that are able to effectively integrate and apply their knowledge perform better at implementing more competitive pricing strategies. This means that companies are able to better understand market dynamics and consumer demand when leveraging internal and external knowledge resources, so that they can develop pricing strategies that are more in line with market conditions.

Specifically, when companies have strong integration and application capabilities, they are able to leverage industry trends, consumer behavior, and competitors' pricing strategies to optimize their pricing decisions. For example, through market research and data analysis, businesses are able to identify changes in customer price sensitivity and adjust their pricing to attract more customers. In addition, this knowledge integration enables companies to identify and realize cost savings to offer competitive pricing without sacrificing profits. On the other hand, the ability of a business to apply its knowledge effectively also helps to respond quickly to market changes. When market conditions change, these companies are able to adjust their pricing strategies in a timely manner to remain competitive in the market.



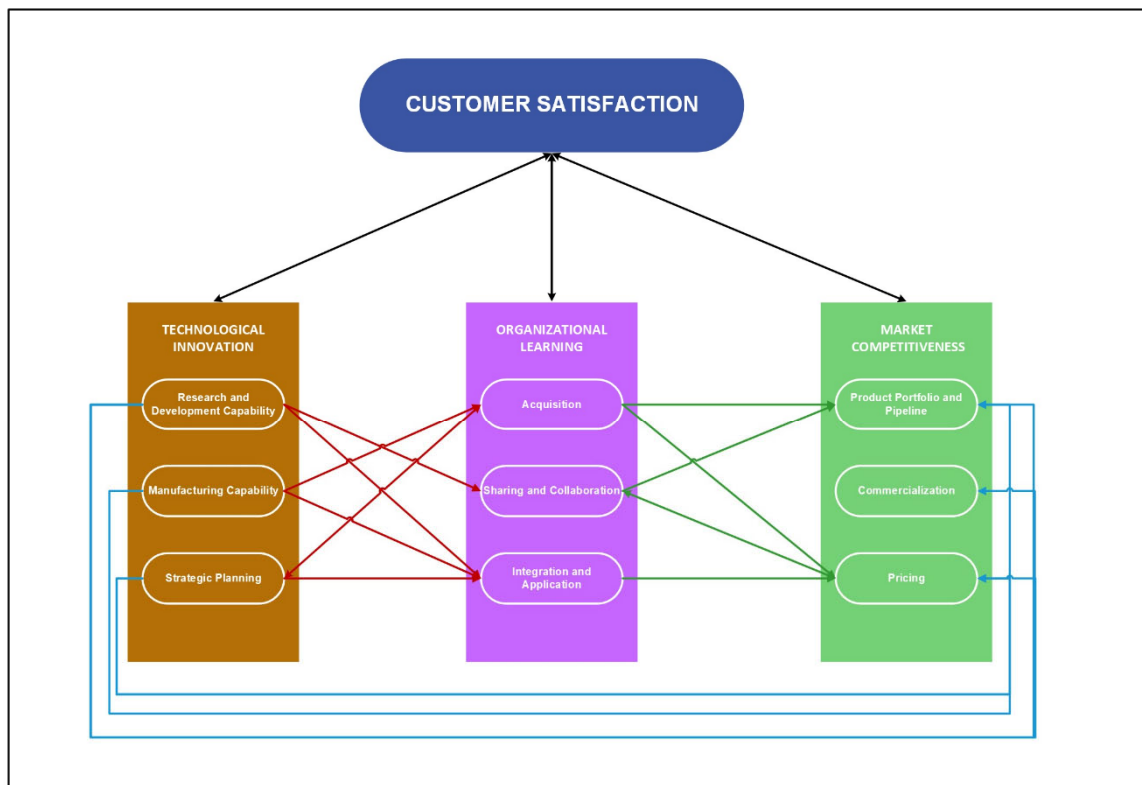
**Research Output**

Figure 1. Enhanced Customer Satisfaction Framework

**4. Conclusions and recommendations**

Technological innovation is crucial for market competitiveness in pharmaceutical companies, involving research and development (R&D), manufacturing capabilities, and strategic planning. Continuous investment in R&D enables companies to develop new drugs and technologies, while manufacturing capabilities ensure high-quality products. Strategic planning helps allocate resources effectively for long-term success. Organizational learning enhances flexibility and adaptability by acquiring, sharing, and applying knowledge effectively. This allows companies to respond quickly to market changes, optimize internal processes, and improve operational efficiency. Market competitiveness directly impacts customer satisfaction, and companies can increase market share and customer satisfaction by offering diverse product portfolios and flexible pricing strategies. Knowledge management and innovation integration are essential for driving technological innovation in pharmaceutical companies.

Pharmaceutical companies should focus on customer-centric innovation, conducting market research to understand customer needs and creating a diversified product portfolio. Customizing products and services to meet specific needs and providing flexible pricing strategies can improve customer satisfaction and loyalty. Aligning innovation with long-term strategic objectives and regularly reviewing and adjusting strategies can ensure sustainability. Organizational learning is crucial in pharmaceutical innovation, with leadership setting clear learning goals and promoting continuous breakthroughs. Market competition is essential, and cross-departmental collaboration is key. Increased R&D investment, optimized production processes, and improved brand image can drive product differentiation. Digital tools and social media platforms can strengthen interaction with patients and medical professionals. Knowledge management should be strengthened through advanced platforms, collaboration with external experts, and strategic cooperation between R&D and manufacturing departments. Agile production processes can help respond quickly to market demand. By focusing on resource sharing and complementary advantages, pharmaceutical enterprises can accelerate the innovation process and maintain competitiveness. The leadership should identify potential cooperation opportunities with various institutions, including research institutions, universities, and technology companies.

They should establish a network of cooperative relationships through high-level visits, industry forums, and seminars. Enterprises should clarify their core advantages and strategic needs, considering technology, market, and resources. A clear cooperation framework is essential, including rights, obligations, timelines, and results distribution. A special cooperation management team is responsible for daily communication and coordination.

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