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Technological innovation, marketing innovation, and business performance of marketing enterprises in China

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Abstract

China's manufacturing sector has undergone a significant transformation, shifting from a focus on low-cost production to one emphasizing innovation. This study mainly discusses the influence of technological innovation, marketing innovation on business performance in Chinese manufacturing enterprises. First, scientific and technological innovation plays an important role in the development of enterprises, through the introduction of new technologies, new equipment, improve production efficiency, reduce costs, thereby improving the competitiveness of enterprises. Secondly, marketing innovation is an important means for enterprises to expand the market and increase market share. Through innovative marketing strategies, enterprises can meet consumer demand and improve brand awareness. Finally, the enterprise benefit is an important index to measure the development of the enterprise. Both technological innovation and marketing innovation can have a positive impact on the enterprise benefit. Based on empirical research, this paper verifies the correlation between technological innovation, marketing innovation and enterprise efficiency by collecting and analyzing relevant data. The results show that both technological innovation and marketing innovation can significantly improve the performance of enterprises and play an important role in promoting the development of China's manufacturing industry.

Keywords: technology innovation, marketing innovation, business performance, manufacturing enterprises

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1. Introduction

Nowadays, people are living in a new era of rapid advances in science and technology, rapid changes in cities and economic globalization. Benefit from the development of science and technology, countries around the world are becoming more interdependent and more interconnected. However, globalization has not only brought economic development, but also created a huge problem for the sustainable development of the earth's environment. At the same time, people are facing unprecedented challenges to the environment. Some manufacturing enterprises do not pay attention to the protection of the environment in the process of production and processing, it caused varying degrees of environmental pollution. Additionally, the pollution caused by some enterprises may be irreversible. A marketing innovation strategy can solve the problem of improving customer and improve marketing performance and outcomes. China faces intensifying competition from developing economies with cheaper labor costs. To maintain a competitive edge, Chinese manufacturers must focus on innovation as Chinese consumers are becoming increasingly sophisticated, demanding higher quality, differentiated products, and a seamless customer experience (CBBC, 2022).

At present, the situation that China's manufacturing industry mainly relies on foreign countries for production technology, especially key technologies, has not been fundamentally changed. At the same time, the traditional manufacturing industry only focuses on production and does not pay attention to the establishment of marketing innovation strategy, so the popularity of products is increasingly blurred, and then replaced by cheaper products. At the same time, China's manufacturing enterprises ignored the protection of the environment and sustainable development in the stage of booming development. Over exploitation and waste of resources raise the price of raw materials at their root. This vicious circle has a very bad impact on the market performance and sustainable performance of Chinese manufacturing enterprises (Chai et al., 2023).

Although the technological innovation of China's manufacturing industry has been improved, the brand marketing ability is still weak, the overall marketing investment is insufficient, and the lack of world-class independent brands, so it is always at the low end of the industrial chain, it is difficult to obtain higher returns, and it is easily replaced. This study is imperative as it will be a springboard for entrepreneurs to place particular emphasis on how to improve China's manufacturing industry creative capacity and marketing strategy innovation, and then improve the brand competitiveness in the global scope in the long run of economic development.

Objectives of the Study - The study aimed to analyze the relationship among technology innovation, marketing innovation and business performance to come up with integrated innovative management framework for manufacturing enterprises in China. Specifically, it aimed to determine the effects of technological innovation from three aspects: manufacturing process, product improvement, and new technology infusion; describe the marketing innovation in manufacturing company in terms of market exploration, relationship marketing and customer co-creation; determine the business performance in terms of financial, non-financial and market performance; test the significant relationship of technology and marketing innovation to business performance of the company; and to come up with innovation management integrated framework for Chinese production enterprises.

2. Methods

Research Design - This study used descriptive type of research. Descriptive research is often the first step in exploring a new topic or phenomenon. It provides a foundational understanding of "what" exists and "how" it functions. This initial groundwork paves the way for more targeted research methods like correlation or

experimental designs. This uncovers patterns and trends within a population or phenomenon. By analyzing data from surveys, observations, or case studies, researchers can identify characteristics, frequencies, and relationships that might not have been apparent before. These insights can be crucial for informing future research questions and hypotheses.

Participants of the Study - The survey crossed company and geographic boundaries because the questionnaire was distributed through the Internet platform "Wenjuanxing". A total of 300 questionnaires were distributed and 298 valid questionnaires were collected. Since the author is located in Shandong Province, China, the research and development department and marketing department of the production enterprises investigated are concentrated in Shandong Province. The city already has a strong industrial base and a famous industrial chain. As a developed and strong province in industry and manufacturing industry in our country, environmental problems and sustainable development problems come out. Therefore, transformation of scientific and technological innovation and marketing innovation as soon as possible have become the fundamental driving force to promote the sustainable development of this city.

Instrument of the Study - The author designed the questionnaire and collected the data according to the research field. Likert 4 scale was used for measurement. The questionnaire consists of three parts: the first is to investigate the personal information of the respondents, to effectively screen the questionnaire data; Secondly, the three variables proposed in the theme of the paper were measured. To further improve the structure and expression of the questionnaire, 30 experts were invited to pre-test the questionnaire after the questionnaire was designed. According to the Cronbach's Alpha results of each dimensions, the corresponding Cronbach's Alpha values of the nine dimensions designed in this paper are 0.901, 0.905, 0.897, 0.854, 0.856, 0.904, 0.888, 0.875 and 0.877 respectively. The Cronbach Alpha coefficient of the overall scale is 0.925, which is greater than 0.7, indicating that the internal consistency of each dimension of the questionnaire is good, so the reliability of the survey results is excellent.

Data Gathering Procedures - The author completed the questionnaire through literature analysis and expert opinion integration. Pre-survey was conducted by sending questionnaires online through the Internet questionnaire platform. Through the guidance of the tutor, the questionnaire was modified and improved, and then the questionnaire was distributed online through email, wechat and other communication methods.

Data Analysis - Different statistical tools were used in this study to count, code, and interpret the data. The first is the descriptive statistical analysis of frequency distributions and weighted means to obtain an overview of the relevant variables using quantitative research methods. Second, analysis of variance was used to test for significant differences between two or more sample means. Third, Pearson Correlation test was used to verify the correlation between all variables, which provided a preliminary basis for subsequent regression analysis. Based on descriptive statistics and correlation statistical analysis, the effects of production innovation and customer marketing- oriented management were empirically tested using multiple regression. To achieve the objectives of this study, the above statistical tools were used accordingly. Meanwhile, all data were processed using the PASW statistical version to ensure the accuracy of the study results.

Ethical Considerations - The researchers should respect the dignity of research participants. Before the start of the study, full consent should be obtained from the participants. Meanwhile, the protection of the research participants privacy should be ensured. Adequate level of confidentiality of the research data was ensured. Any type of communication in relation to the research should be done with honesty and transparency. Individuals and organizations should participate in the research on condition of anonymity. Name or personal identification was not required to write in the questionnaire. Any type of misleading information, as well as representation of primary data findings in a biased way was avoided.

3. Results and discussion

Table 1

Summary Table on Effects of Technological Innovation

Key Result Areas	Composite Mean	VI	Rank
Manufacturing Process	2.82	Agree	2
Product Improvement	2.81	Agree	3
New Technology Infusion	2.84	Agree	1
Grand Composite Mean	2.82	Agree	

Legend:3.50-4.00=Strongly Agree;2.50-3.49=Agree;1.50-2.49=Disagree;1.00-1.49=Strongly Disagree

Table 1 shows the summary assessment of the effects of technological innovation. The grand composite mean value was 2.82, indicating that the indicators were consistent. The evaluations of all projects are consistent, among which new technology Infusion ranked first with a weighted average score of 2.84. Industrial manufacturing is very important for a country, industry determines the comprehensive national strength.

The manufacturing process ranked second with a weighted average score of 2.82. The interview shows the importance of manufacturing process in technological Innovation. Different from product innovation, process innovation focuses on the process of activities and the results of product innovation are mainly reflected in the material form of products. The results of technological innovation can not only penetrate into the workers, labor materials and labor objects, but also penetrate into the combination of various productive forces. Producers of product innovations mainly provide new products to users, while producers of process innovations are also users of innovations. Product improvement ranked third with an average weighted score of 2.81. It is also known as product relaunch strategy, a marketing strategy that significantly changes a part of a product in order to attract new customers and maintain old customers. To reduce the impact of product life cycle on the environment, enterprises make use of product innovation or product improvement, improve technical components or materials, and meet market demand by creating new products (Cheng et al., 2014).

Table 2

Summary Table on Marketing Innovation in Manufacturing Company

Key Result Areas	Composite Mean	VI	Rank
Marketing Exploration	2.84	Agree	1
Relationship Marketing	2.81	Agree	2
Customer Co-creation	2.80	Agree	3
Grand Composite Mean	2.82	Agree	

Legend:3.50-4.00=Strongly Agree;2.50-3.49=Agree;1.50-2.49=Disagree;1.00-1.49=Strongly Disagree

Table 2 shows a summary table of Marketing Innovation in Manufacturing Company. The grand composite mean value is 2.82; this indicates generally positive perception of marketing innovation's role in manufacturing companies. Identifying new markets and understanding customers) was ranked highest (1), potentially reflecting its perceived importance for growth and strategic decision-making. It aligns with the emphasis on understanding customer needs and identifying new markets for growth (Lakha et al., 2020). Manufacturing professionals also generally view various marketing innovation approaches favorably (Ghiani et al., 2023). It is followed by the relationship marketing (2.81); the item with the lowest score is the customer co-creation(2.80). Relationship Marketing is seen as valuable for building strong customer connections, potentially leading to increased satisfaction and brand reputation (Kumar et al., 2018). Finally, customer co-creation is recognized for its potential to improve product quality, boost customer engagement, and further strengthen brand image (Ghobakhloo et al., 2020).

Table 3

Summary Table on Business Performance

Key Result Areas	Composite Mean	VI	Rank
Financial Performance	2.81	Agree	2.5
Non-financial Performance	2.81	Agree	2.5
Market Performance	2.86	Agree	1
Grand Composite Mean	2.83	Agree	

Legend:3.50-4.00=Strongly Agree;2.50-3.49=Agree;1.50-2.49=Disagree;1.00-1.49=Strongly Disagree

Table 3 shows a summary of the company's business performance in terms of financial performance, non-financial performance and market performance. The grand composite mean is 2.83, which shows that the business is performing moderately well overall, with market performance being the strongest area. Innovation has a critical impact on a company's performance. it is the key to long-term competitiveness and constitutes an important opportunity for manufacturing enterprises to strengthen innovation and knowledge, as they are expected to benefit more from the performance of the private sector and economic development. Rosenbusch et al. (2011) points out that market innovation and product innovation strategy are the key factors affecting market performance. Improving competitiveness has become an indispensable factor for enterprises to survive in the market. To take the lead from competitors, innovative activities have created outstanding value and benefits for enterprises.

Based on highly organized and carried out activities based on long-term strategic goals, enterprises began to optimize the organizational management structure, reform the financial management model, and strengthen the financial values adhered to by the financial practitioners of enterprises. To sum up, the impact of the financial management of enterprises on the study outside stem starting stage of the imperfect state. The existing research at home and abroad mainly focuses on the impact of network development and enterprise financial management, but the impact research of enterprise financial management based on the perspective of scientific and technological innovation is significantly insufficient, which also proves that the impact research of scientific and technological innovation and enterprise financial management has considerable theoretical value and practical significance, and provides an efficient development environment for enterprise financial management in the era of scientific and technological innovation.

Table 4

Relationship Between Technological Innovation and Marketing Innovation

Variables	rho	p-value	Interpretation
Manufacturing Process			
Marketing Exploration	0.618**	0.000	Highly Significant
Relationship Marketing	0.636**	0.000	Highly Significant
Customer Co-creation	0.647**	0.000	Highly Significant
Product Improvement			
Marketing Exploration	0.605**	0.000	Highly Significant
Relationship Marketing	0.640**	0.000	Highly Significant
Customer Co-creation	0.625**	0.000	Highly Significant
New Technology Infusion			
Marketing Exploration	0.600**	0.000	Highly Significant
Relationship Marketing	0.678**	0.000	Highly Significant
Customer Co-creation	0.575**	0.000	Highly Significant

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

Table 4 shows the relationship between technological innovation and marketing innovation. As seen in the table, the computed rho-values ranging from 0.575 to 0.678 indicate moderate to strong direct relationship among the sub variables of technological innovation and marketing innovation. There was a statistically significant relationship between technological innovation and marketing innovation because the obtained p-values were less than 0.01. This means that there is an important relationship, and only shows that the better the technological innovation, the better the marketing innovation of the enterprise.

By influencing entry barriers, technological innovation can give a company a leg up. It can create a learning curve advantage through unique knowledge or intellectual property rights. Proprietary technology can also lead to lower production or R & D costs, giving the company a cost advantage. Additionally, technology can increase switching costs for customers, making it harder for competitors to steal market share. Technology can also reshape the dynamics of an industry. It can impact buyer power by changing product differentiation or switching costs. Similarly, advancements can create new suppliers or substitutes, affecting bargaining power with suppliers. Marketing and innovation are two sides of the same coin, both crucial for business success. Marketing connects with customers and drives sales, while innovation ensures a competitive edge. They are interdependent; marketing needs innovative products/services to promote, and innovation needs strong marketing for a successful market launch.

Table 5

Relationship Between Technological Innovation and Business Performance

Variables	rho	p-value	Interpretation
Manufacturing Process			
Financial Performance	0.667**	0.000	Highly Significant
Non-financial Performance	0.664**	0.000	Highly Significant
Market Performance	0.691**	0.000	Highly Significant
Product Improvement			
Financial Performance	0.656**	0.000	Highly Significant
Non-financial Performance	0.655**	0.000	Highly Significant
Market Performance	0.642**	0.000	Highly Significant
New Technology Infusion			
Financial Performance	0.636**	0.000	Highly Significant
Non-financial Performance	0.548**	0.000	Highly Significant
Market Performance	0.600**	0.000	Highly Significant

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

Table 5 shows the relationship between technological innovation and business performance. As seen in the table, the computed rho-values ranging from 0.548 to 0.691 indicate moderate to strong direct relationship among the sub variables of technological innovation and business performance. There was a statistically significant relationship between technological innovation and business performance because the obtained p-values were less than 0.01. This means that there is an important relationship, and only shows that the better the technological innovation, the better the business performance of the enterprise. In the study of Dong et al. (2021), their findings demonstrate that technological innovation has a positive impact on business performance, with business model innovation. Playing a mediating role company that innovates technologically might also develop new business models to leverage that technology. This combination ultimately leads to improved performance.

Table 6

Relationship Between Marketing Innovation and Business Performance

Variables	rho	p-value	Interpretation
Marketing Exploration			
Financial Performance	0.596**	0.000	Highly Significant
Non-financial Performance	0.625**	0.000	Highly Significant
Market Performance	0.589**	0.000	Highly Significant
Relationship Marketing			
Financial Performance	0.655**	0.000	Highly Significant
Non-financial Performance	0.667**	0.000	Highly Significant
Market Performance	0.666**	0.000	Highly Significant
Customer Co-creation			
Financial Performance	0.632**	0.000	Highly Significant
Non-financial Performance	0.625**	0.000	Highly Significant
Market Performance	0.622**	0.000	Highly Significant

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

Table 6 illustrates the relationship between marketing innovation and business performance and analyzes the responsiveness of marketing exploration, the responsiveness of relationship marketing, and the responsiveness of customer co-creation. According to the results, the calculated r value shows that there is a strong direct correlation between the responsiveness of marketing innovation and business performance, and the calculated p value is less than 0.01α. This means that there is a significant relationship between marketing innovation and business performance. Indicating that the better the supply marketing innovation, the greater the business performance. Overall, it means that companies implementing various marketing innovation strategies tend to experience significant improvements across multiple business performance metrics. This signifies the strategic importance of marketing innovation for achieving financial success, building strong customer relationships, and gaining a competitive edge in the market.

As can be seen from Figure 1, for manufacturing enterprises, the innovation management integrated framework is composed of technology innovation, marketing innovation and business performance improvement. The integration framework among technological innovation, marketing innovation and business performance is a dynamic and mutually reinforcing system. In this framework, scientific and technological innovation is the foundation, marketing innovation is the key, and business performance is the goal.

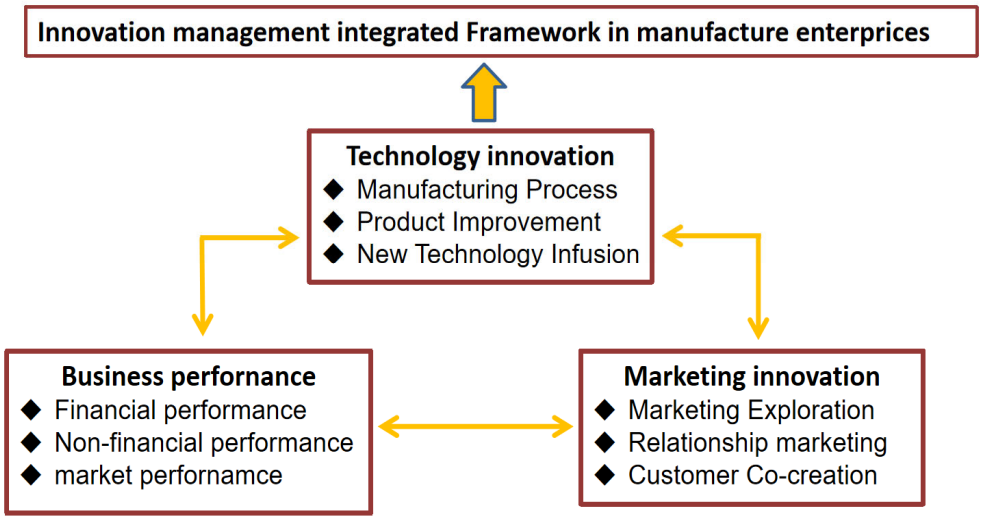

Figure 1. Innovation Management Integrated Framework in Manufacture Enterprises

1. Scientific and technological innovation: Scientific and technological innovation is the source of enterprise development, through the development of new technologies, new products or new services to enhance the core competitiveness of enterprises. Scientific and technological innovation can improve production efficiency, reduce costs, improve product performance, etc., and bring greater value to enterprises and consumers.

2. Marketing innovation: Marketing innovation is a key means for enterprises to achieve market goals. Through new marketing strategies, channels or concepts, they can better understand and meet consumer needs, improve market response speed and expand market share. Marketing innovation can improve brand awareness, reputation and loyalty, thereby improving business performance.

3. Business performance: Business performance is the result of technological innovation and marketing innovation, reflecting the overall performance and competitiveness of the enterprise in the market. Business performance, including financial performance, market position, brand value and other aspects, is an important indicator to evaluate the success of an enterprise.

In this integrated framework, technological innovation and marketing innovation promote and support each

other. Scientific and technological innovation can provide new tools and platforms for marketing innovation, such as the Internet, big data and artificial intelligence, so as to make marketing activities more accurate and efficient. At the same time, marketing innovation can provide market feedback for scientific and technological innovation, guide the direction and focus of scientific and technological innovation, and ensure that scientific and technological innovation matches market demand.

Enterprises need to find a balance and coordination between these three dimensions to achieve continuous innovation and development: through technological innovation to improve the quality of products and services, through marketing innovation to improve market competitiveness, so as to improve business performance. At the same time, enterprises also need to continuously optimize internal management, improve operational efficiency, and provide strong support for scientific and technological innovation and marketing innovation.

4. Conclusions and recommendations

Respondents moderately agree with the importance of technological innovation and marketing innovation in business performance in business management practices. The respondents moderately agree that by innovating production processes, improving product quality, and using high-tech production and management methods, enterprises can greatly improve the benefits obtained through scientific and technological innovation. Respondents expressed moderate agreement with firms' competitive advantages in terms of price, quality, delivery reliability, time to market, and product innovation. There is a highly significant relationship between marketing innovation, marketing exploration ability, strong relationship in marketing ability and customer co-creation ability of enterprises which can improve the performance of enterprises. A framework for innovation management was developed.

The company may develop new products with more market competitiveness or improve existing products in order to meet the needs of consumers. The company may respond to market changes rapidly to cope with the changing market environment. The company may adopt the Innovation Management Framework for better management of the business. Future researchers may conduct validation of the study using additional variables to measure the business performance.

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