

# *Influencing Factors of Dual Innovation in Manufacturing Companies*

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**Abstract:** Innovation is the key driving force for achieving high-quality economic development, and the digital economy is an important symbol of China's high-quality economic development entering a new era. Digital transformation relies on digital technology to trigger disruptive changes in many aspects such as enterprise process reengineering, thinking mode resetting, routine update, organizational restructuring, relationship adjustment, reshaping the internal management and resource allocation mode of enterprises, forming a new business model dominated by consumer value, and then changing the path of enterprise value creation. Innovation is no longer a multiple-choice question for manufacturing companies, but has become a must-answer question. Dual innovation is a concrete manifestation of the innovation behavior of enterprises, including two types of exploratory innovation and exploitative innovation, and the analysis of its influencing factors is important. This paper takes manufacturing enterprises as the research object, combines the existing literature, analyzes the influencing factors of dual innovation in manufacturing enterprises from the organization level, manager level, market level and government level, and provides development suggestions and strategies for dual innovation in manufacturing enterprises from three levels: organization level, manager level and government level.

## 1. Introduction

The innovation model of traditional manufacturing enterprises is based on several basic innovations, lacking substantial innovation of business concepts, and there are problems such as unclear innovation paths, insufficient innovation funds and insufficient innovation efforts <sup>[1]</sup>. Therefore, for manufacturing enterprises, they need dual innovation to help them complete the transformation and upgrading. Dual innovation includes two types of innovation: utilization innovation and exploration innovation. Utilization innovation is a kind of incremental and less risky innovation activity using existing knowledge and resources, which is important for the short-term survival of enterprises; the other is a kind of breakthrough and risky innovation activity exploring

new knowledge and resources, which is crucial for the long-term development of enterprises. For manufacturing enterprises, to achieve a leap in industry competitiveness, market insight, and product and service innovation, to reshape their competitiveness, and to gain competitive advantages for sustainable development, they need to have innovation in both of these areas. Under the traditional economic model, enterprises are often unable to balance the dual innovation activities due to their mental models and resource constraints, and they have a mutually exclusive relationship. Therefore, it is especially important for manufacturing enterprises to analyze the factors influencing their dual innovation activities in the internal and external environment, and to improve their dual innovation capability and level of dual innovation.

In recent years, due to the increasing uncertainty and complexity of the external environment, the dynamic capabilities of enterprises have become more demanding, and the term "dual organization" has gradually entered the vision of managers. Under the pressure of the environment, organizations should have the dual development of synergy and efficiency to adapt to the complex and changing environment. Scholars have basically reached a consensus on the need to balance exploratory and exploitative innovation, but there is no clear definition or sound theoretical framework. The development process of dual innovation is relatively short and needs further refinement and development.

The term "duality" was first introduced by Duncan in 1976, who argued that firms should apply exploratory and exploitative innovation in the development of organizational structures and business management processes<sup>[2]</sup>. A review of the literature shows that there are four types of relationships between exploratory and exploitative innovation: (1) competition and dichotomy. March (1991), based on the resource theory, separates the two types of innovation activities and argues that firms cannot combine both types of innovation activities and that exploitative and exploratory innovation are "either/or" relationships<sup>[3]</sup>. (2) Differentiation: Andriopoulos (2009) argued that exploratory and exploitative innovation cannot be parallel in the same space and time, but that firms can take certain measures to achieve a balance between the two<sup>[4]</sup>. (3) Integration and integration. Lubatkin (2006) argued that exploitative and exploratory innovations do not have to be fundamentally competitive, and that they can take place in the same space and time<sup>[5]</sup>. (4) Balance and combination. Based on the exploration and exploitation theory perspective, Li (2009) analyzed the organizational behavior level and concluded that the balance of exploratory and exploitation innovation has a very important role in performance improvement<sup>[6, 7]</sup>.

The literature on the factors influencing dual innovation in manufacturing firms revolves around both the internal and external environments. Firstly, regarding the internal environment, Zhou (2013) extended the relationship between contextual culture and dual innovation from the perspective of organizational culture by analyzing data from 102 manufacturing firms and concluded that collectivist culture promotes corporate dual innovation, while centralized structure negatively moderates the impact of collectivist culture on dual innovation<sup>[8]</sup>. Ma (2016) classified strategic choices into corporate cost leadership strategy, differentiation strategy, and focus strategy, and based on 187 samples, concluded that differentiation strategy and focus strategy play a certain role in promoting corporate dual innovation behavior, and the effect of cost leadership strategy on dual innovation is not significant<sup>[9]</sup>. Following the logic of "dynamic-attitude-behavioral response-economic consequences", Li (2020) argued that the combination of political and compensation incentives of executives can enhance the performance of dual innovation<sup>[10]</sup>. Wang (2022) empirically tested the relationship between managerial overconfidence and exploratory and exploitative innovation in a sample of listed companies and found that managerial overconfidence promotes exploratory innovation and inhibits exploitative innovation<sup>[11]</sup>.

Regarding the external environment, Yang and Chen (2021) concluded that regional relational culture promotes firms' dual innovation through resource supply and sharing mechanisms, and that

regions with weak relational culture are more helpful for firms to carry out exploratory innovation to improve innovation performance<sup>[12]</sup>. Based on the perspective of dual innovation, Li (2022) used Shanghai and Shenzhen A-share market companies as the research objects and concluded that government incentive policies would promote corporate dual innovation, and the incentive effect on exploratory innovation is better than exploitative innovation<sup>[13]</sup>.

In summary, this paper will examine the factors influencing dual innovation in manufacturing companies from both the internal and external environments.

## **2. Analysis of Factors Influencing Dual Innovation in Manufacturing Companies**

### **2.1. Internal Environment**

By combing through the existing literature, most of the studies on the factors influencing dual innovation in manufacturing companies are mainly empirical studies, which are analyzed at the organizational level and managerial level. At the organizational level, four aspects are discussed: organizational structure, organizational culture, strategic orientation, and organizational learning. The managerial level is discussed in terms of managerial perception, managerial leadership style, and managerial tenure.

#### **2.1.1. Organizational Level**

##### **2.1.1.1. Organizational Structure**

Organizational structure is important for the innovative activities of an organization because it involves activities such as the introduction of technology and capital from outside the organization and the internal integration of organizational resources. Organizational structure can be divided into formal and informal organizational structures. Formal organizational structure can be divided into centralized, mechanical, and formalized organizational structure; informal organizational structure can be divided into decentralized, organic, and connected organizational structure<sup>[14]</sup>. In a centralized organizational structure, exploratory innovation may be resisted by some employees and departments because of its large scope and depth. For department managers, they are reluctant to undertake risky innovation activities to break their power structure, which can prevent the organization from exploratory innovation. Therefore, for a centralized organization, it may be more willing to engage in exploitative innovation<sup>[15, 16]</sup>. In an organic organization, there are no permanent positions or functional boundaries, employees can break through communication barriers to make rapid adjustments when risks occur, and the entire workforce is highly motivated and technically competent, which facilitates exploratory innovation<sup>[17]</sup>.

##### **2.1.1.2. Organizational Culture**

The differences exhibited by companies in innovation activities are essentially caused by the cultural differences between companies<sup>[18]</sup>. Only a corporate culture that matches the innovative development of a company can penetrate the business philosophy into the development of the company. By establishing innovation values and creating an innovative atmosphere within the company, as well as increasing resources and financial investment, companies can promote dual innovation activities<sup>[19]</sup>.

For exploratory innovation, first of all, the organization forms innovative values, spreads innovative ideas, and changes employees' perceptions so as to increase the tolerance of innovative behavior within the company. As companies are more willing to take the risk of innovation failure, employees' creativity and inventiveness can be stimulated to the greatest extent, and the

organization can make more disruptive and significant changes to meet the organization's innovation needs. Secondly, the organizational culture forms the value norms and behavioral concepts commonly recognized by all employees within the company, which reduces the friction within the organization, better unites the strength of collaborative research and development to accelerate precise innovation, fully mobilizes resources to a wider range of product development and process innovation, and thus better starts exploratory innovation activities<sup>[20]</sup>.

In the case of developmental innovation, the organizational culture subconsciously creates a trusting and collaborative innovation atmosphere within the company through the formation of business practices and laws that are recognized by employees. In this process, managers and employees spontaneously identify problems and shortcomings in R&D and production, take the initiative to optimize and improve production processes and resource allocation, enhance equipment operation, and optimize energy efficiency and the entire production process.

### **2.1.1.3. Strategic Orientation**

Strategic orientation is the strategic direction that guides a company's activities and is the guiding principle of the company, including entrepreneurial orientation, market orientation and customer orientation<sup>[21]</sup>. Entrepreneurial orientation is an important competency that is necessary for companies to start innovative activities<sup>[22]</sup>. On the one hand, entrepreneurially oriented companies are able to take innovation risks and think innovatively, using existing knowledge and resources to make use of innovation. On the other hand, they can be proactive in the face of competitors, act independently and ahead of the curve when faced with market opportunities, and develop new production methods for exploratory innovation. The focus of customer orientation is on customer-centered precision marketing, through the construction of customer portraits, insight into customer needs, customer data response to production, design and other front-end links, through customer-driven business innovation and operational optimization, accelerating product innovation, production model and business model change.

### **2.1.1.4. Organizational Learning**

Nevis (1995) considered that organizational learning is divided into three stages, which are knowledge absorption, knowledge sharing and knowledge application<sup>[23]</sup>. First, in the knowledge absorption stage, the organization collects a large amount of relevant information and integrates it, and disseminates the integrated information within the organization, which provides knowledge resources for the organization to carry out dual innovation activities and improves the organization's knowledge base<sup>[24]</sup>. Secondly, in the knowledge sharing stage, through the integration and processing of different types and uses of information, the depth and breadth of existing knowledge are extended, and the flow of knowledge between different systems and businesses is accelerated, thus exploring a new path of enterprise innovation and development<sup>[25]</sup>.

### **2.1.2. Manager Level**

Managers are the makers of corporate development strategies and should have insight into market demand and grasp the cutting-edge trends of technological innovation development in the process of corporate development, so as to drive the company to break the technological barriers, improve the productivity of the company and accelerate the conversion rate of results. The manager's cognition, leadership style tenure and other attributes will determine the resource allocation and strategy formulation of the manufacturing enterprises in exploratory and exploitative innovation.

### 2.1.2.1. Manager Perception

Managerial cognition is the process of processing and understanding information and defining, judging and coding things in the process of business development, which plays a decisive role in the choice of corporate strategy <sup>[26]</sup>. For managers with high cognitive level, on the one hand, they collect a large amount of relevant information through various channels before making decisions. This perfect and rich knowledge base not only makes managers more willing to take risks for exploratory innovation, but also enables them to improve and optimize the existing production processes and production equipment to facilitate the use of innovation. On the other hand, managers with high cognitive level can balance the relationship between exploratory innovation and utilization innovation when formulating strategies, and adopt appropriate methods to make the two complementary and mutually reinforcing.

### 2.1.2.2. Managerial Leadership Style

Managerial leadership style is an important way for organizations to achieve leadership effectiveness <sup>[27]</sup> and is an important factor in the achievement of organizational goals and employee development. Leadership style determines what goals the organization will achieve in the future, how it will achieve them, what actions it should take at a certain stage, and the placement of employees. Wang (2022) argued that overconfident managers have a strong curiosity about unknown areas, which on the one hand helps the company to be exposed to over-the-top information and knowledge and promotes exploratory innovation. On the other hand, due to the illusion of control, overconfident managers tend to overestimate the success rate of corporate projects and underestimate corporate risks, both of which lead them to prefer exploratory innovations that are risky and demonstrate their capabilities to exploitative innovations that are less risky <sup>[11]</sup>. From a leadership behavior perspective, Yang (2023) argued that transformational leaders, as role models within the firm, can guide and encourage innovative behavior among managers and employees at all levels of the firm, thus creating a collective sense of innovation within the firm, promoting the active sharing of innovative ideas among all internal actors, and providing a constant impetus for exploratory and exploitative innovation activities <sup>[28]</sup>.

### 2.1.2.3. Tenure of Managers

Managerial tenure is one of the important background characteristics of managers, which can reflect their values, mindset, risk appetite and other characteristics. Zhu (2017) analyzed its impact on dual innovation in terms of both established tenure and expected tenure. First, from the perspective of vested tenure, for managers with shorter tenure, their knowledge of the industry and corporate cognition are shallow, and they are less likely to launch exploitative innovations that require technology and knowledge, and exploratory innovations can bring them more private gains, and they are more willing to launch exploratory innovations. As their tenure increases and their understanding of the industry deepens, the private benefits of exploratory innovation diminish, and managers are more willing to develop exploitative innovations that can maintain the firm's existing core competencies and strengthen their position. Second, in terms of expected tenure, when the expected tenure is short, the investment in innovation is longer, uncertainty is higher, and neither exploratory nor exploitative innovation can bring higher returns <sup>[29]</sup>. This all inhibits the dual innovation activities of the firm. Conversely, when the expected tenure is longer, both exploratory and exploitative innovations will bring some benefits to the firm, but managers may be more focused on long-term performance and more willing to undertake larger change innovation activities in the firm to maintain sustained competitiveness <sup>[30]</sup>.

## 2.2. External Environment

The complex and changing external environment can bring unpredictable risks as well as uncertain performance to manufacturing firms, and both such uncertainty and unpredictability can have some impact on the dual innovation of firms. This study analyzes the factors that influence the external environment on dual innovation in manufacturing firms at the market level and government level.

### 2.2.1. Market Level

When market competition is fierce, companies have to use innovation to ensure market stability in order to maintain their existing market share and stay ahead of the competition. By upgrading the existing production equipment and improving the production process to improve productivity and reduce costs to enhance the competitiveness of the company. When competition between firms is moderate, firms do not over-invest resources in exploitative innovation, but rather develop new products, train technicians, and use new production technologies to build technological advantage, a process that promotes exploratory innovation<sup>[31]</sup>.

### 2.2.2. Government Level

Government subsidies can alleviate firms' financial constraints, reduce their R&D costs and thus stimulate dual innovation. Compared with exploitative innovation, government subsidies have a stronger effect on exploratory innovation. Exploratory innovation requires more capital because it is risky and groundbreaking. Government subsidies can relieve the pressure of underinvestment or high risk, and provide confidence and support for exploratory innovation, while allowing companies to invest more money in their daily operations for long-term benefits<sup>[13]</sup>.

## 3. Conclusion

Dual innovation in manufacturing enterprises is not an overnight process, but a comprehensive and systematic new project. Exploring the factors influencing dual innovation in manufacturing enterprises is important for manufacturing enterprises to explore a new path of development. As a result, this paper proposes the following recommendations.

### 3.1. Organizational Level

First, the cultivation of organizational culture should be emphasized. Organizational culture is an important medium for the adjustment of corporate leadership structure and innovative organizational model, therefore, organizations should pay attention to the construction of innovation culture, continuously excavate and extract the connotation of innovation culture, and encourage employees to establish the awareness of innovation culture, so that it can become the daily behavior pattern of employees, thus improving the dual innovation capability of enterprises while improving the efficiency of business operation. Secondly, manufacturing companies should provide the resources and capabilities needed to carry out dual innovation activities by developing new products, providing new services and adopting new technologies to improve market competitiveness and profitability according to their pioneering spirit. Finally, manufacturing companies should develop strategies based on market changes and customer needs. By gaining more intelligence and information through insight into market changes and consumer needs, they can seize market entry opportunities, reduce market entry risks, and generate more innovative product and technology ideas to facilitate dual innovation activities.



### 3.2. Managerial Level

First of all, managers should understand the company's resources and current development goals, and properly handle the relationship between exploratory innovation and utilization innovation according to the company's development goals and characteristics. Exploratory innovation requires more talent and financial support; exploitative innovation requires more focus on existing products and services. Second, pay attention to the construction of the executive team. The structure of management personnel should be adjusted according to the development needs of their own development stages. At the same time, the tenure of managers can be extended appropriately to avoid frequent replacement of managers. The extension of the term of office will enable managers to form long-term stable expectations and make decisions that are conducive to the innovation and development of the company in the long-term interest of the company. Finally, managers should improve their cognitive ability and enrich their cognitive structure so that they can respond accurately and quickly to changes in the external environment and reduce decision errors caused by cognitive biases, thus helping the company to achieve sustainable competitive advantage and high performance level.

### 3.3. Government Level

First of all, the government should provide support for enterprises to develop new technologies and products as well as cultivate talents by setting up special funds, so as to encourage enterprises to carry out dual innovation and complete transformation and upgrading. Secondly, the government should introduce relevant policies to promote cooperation between enterprises and universities and research institutes, and send technical talents and advanced production technologies to enterprises through universities and research institutes, so as to improve enterprises' innovation ability and talent reserve. Again, it should crack down on intellectual property infringement through strict laws and policies, strengthen the protection of intellectual property rights, and provide a good environmental guarantee for enterprises' dual innovation activities. Finally, the government can establish a technology innovation platform. Through the interconnection of platforms, the flow of advanced production information between different systems, businesses and industries can be accelerated to achieve data collaboration and thus promote the optimization of production equipment and processes and accelerate the pace of technological innovation and transformation of enterprise achievements.

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