

# ***Digital Transformation and Corporate Innovation Quality — Based on an Internal Management Perspective of the Enterprise***

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**Abstract:** In the context of the increasingly fierce global competition and the rapid development of information technology, how to enhance its innovation capabilities and market competitiveness through digital transformation has become a research topic widely concerned about the current academic and practical fields. This article selects the relevant data of China's import and export companies from 2017 to 2021 as a research sample. Through detailed data analysis and case research, it reveals the significant effect of digital transformation in improving the innovation quality of enterprises. The research results show that (1) Digital transformation significantly promotes the improvement of the quality of innovation in enterprises; (2) Digital transformation By optimizing the internal management process of the enterprise and improving the efficiency of resource allocation, it enhances the competitiveness of enterprises during the period of kinetic energy conversion; (3) Digital tools have also promoted the efficient allocation of R & D personnel, promoted cross - departmental collaboration, and enhanced the innovative vitality of enterprises. The research results provide theoretical support for enterprises to optimize management and innovation strategies in the background of digitalization.

**Keywords:** Digital transformation, innovation quality, internal management, corporate innovation.

## **1. Introduction**

In July 2024, General Secretary Xi Jinping pointed out in the Political Bureau of the CPC Central Committee that the external environment changes have intensified, the domestic demand is insufficient, the economic differentiation is obvious, the risks of key areas have increased, and the pain in the conversion of new and old kinetic energy appears. We must not only strengthen the awareness of risk, actively cope, and maintain strategic determination, strengthen confidence, and promote economic movement. In this context, as the main body of a market economy, enterprises shoulder the heavy responsibility of high -quality development. Through innovation -driven, enterprises can promote economic structure adjustment and development mode transformation in the critical period of kinetic energy conversion, and enhance national competitiveness. With the advancement of science and technology and global economic changes, traditional business models and management methods are difficult to adapt to the new situation. In 2024, the government work

report clearly states that it is necessary to further promote the digital economy innovation, promote the integration of digital technology and the real economy, accelerate the digital transformation of manufacturing and service industries, and support platform companies to play a greater role in innovation and international competition. The "Fourteenth Five -Year Plan" Digital Economy Development Plan "proposes that by 2025, the value -added of the core industry of the digital economy will reach 10%of the GDP ratio, which will provide strong policy support and guidance for the digital transformation of enterprises. Digital transformation has therefore become an important means for enterprises to improve their innovation capabilities and respond to challenges.

The impact of digital transformation on corporate innovation has been extensively discussed, revealing its crucial role in promoting innovation activities. Studies show that digital transformation enhances corporate green innovation by improving financial performance, alleviating financing constraints, and boosting ESG performance [1]. It also directly improves operational and market innovation performance, and indirectly promotes innovation through management, investment, operational, and labor empowerment [2]. Additionally, digital transformation reduces information asymmetry, alleviates financing constraints, improves corporate governance, and further fosters green innovation [3]. Higher digital transformation levels correlate with greater innovative investment and output [4]. These studies agree that digital transformation optimizes enterprise operating efficiency, information circulation, and stimulates innovation by enhancing resource allocation and market response speed. Tools like big data, AI, and IoT help enterprises identify market opportunities, predict technical trends, and develop new products and services. However, research has limitations: it often focuses on specific industries like manufacturing or technology, neglecting unique challenges and opportunities in service, agriculture, or traditional industries. Different enterprises have varying technical foundations, management structures, and market environments, affecting how digital transformation impacts their innovation. Thus, research needs to broaden its scope and explore digital transformation's specific effects in various industries and enterprise types. Furthermore, research from the perspective of resource-based and dynamic capabilities is lacking, especially regarding the quality of enterprise innovation. Digital transformation can promote innovation by optimizing supply chain concentration, human capital structure [5], and enhancing cooperation among enterprises and other innovative entities [6]. Dynamic capabilities, crucial for adapting to external market changes and maintaining competitive advantages, can lead to different transformation outcomes through data element integration [7]. In today's competitive and uncertain market, companies must innovate sustainably and maintain high-quality innovation. Digital transformation, as a strategic choice, profoundly changes enterprise internal management and significantly impacts innovation quality.

This study analyzes China's import-export firms' data (2017-2021) to explore how digital transformation boosts innovation quality through internal management. Results show significant positive impacts, optimizing management and resource allocation. Financial factors like enterprise size, liabilities, and asset returns also influence innovation quality. These findings offer crucial insights for enterprises' innovation strategies and resource allocation plans in the digital era, highlighting digital transformation's impact and contributing theoretically and practically.

## 2. Research hypothesis

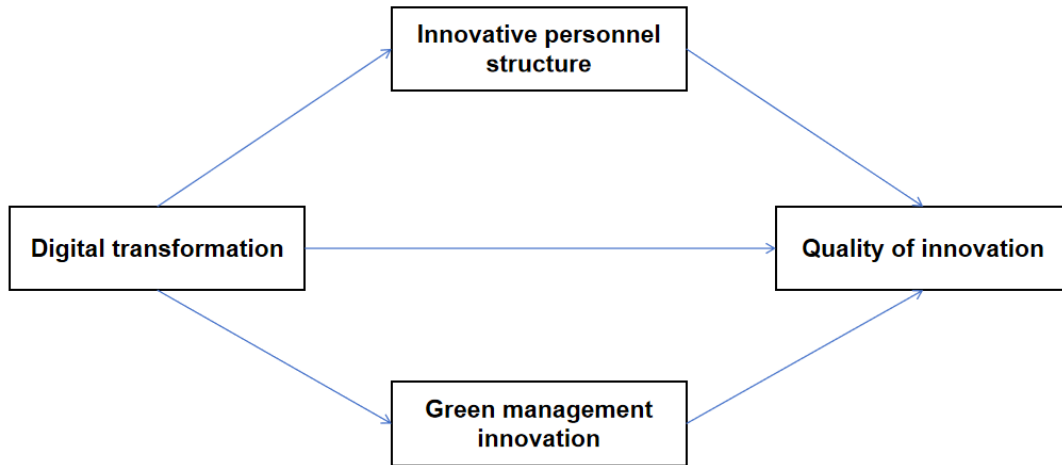


Figure 1: Concept model.

The digital transformation of an enterprise involves several key areas. Firstly, upgrading the information system integrates business data and processes, breaking "information islands," and enabling real-time data sharing. This enhances internal coordination and provides managers with a comprehensive view for forward-looking decisions. Secondly, data-driven decision-making, leveraging big data and analytics, improves decision accuracy and speed, reducing subjectivity and uncertainty. This method enhances market sensitivity and innovative opportunities. Additionally, intelligent management tools using AI, machine learning, and IoT automate processes, optimize production, improve supply chain efficiency, and reduce risks and costs. For innovation, these tools simplify R&D, accelerate product development, and boost market conversion rates. In summary, digital transformation optimizes internal management, resource allocation, and empowers innovation processes, improving innovation quality and value.

H1: There is a positive relationship between digital transformation and the quality of corporate innovation. That is, as the level of digitalization increases, the innovation quality of enterprises will increase.

The quality of enterprise innovation hinges on human resource allocation, especially R&D personnel. Digital transformation optimizes this process by introducing advanced tools and data analysis, enabling precise R&D staffing and resource matching based on project needs and skills. It fosters cross-departmental collaboration, knowledge sharing, and an innovative atmosphere. For instance, Huawei, a leading ICT provider, uses digital tools like big data and AI for refined R&D team management, ensuring it stays ahead in 5G, cloud computing, and AI by deploying top talents swiftly. SF Express leverages an intelligent logistics network and data platform to automate logistics and upgrade human resource management. It uses digital tools to analyze R&D personnel performance, aiding talent selection, training, and incentives. By collaborating externally, SF enhances its innovation ecosystem, service quality, and competitiveness. In summary, digital transformation vitally optimizes human resource management and R&D personnel allocation, enabling precise innovation identification and swift talent deployment.

H2: The digital transformation of enterprises has indirectly improved the innovative quality of enterprises by improving the structure of innovative personnel (measured by the proportion of R & D personnel).

In the context of environmental protection and sustainable development, companies face competition and stringent environmental regulations. Green management innovation, supported by digital transformation, enhances market competitiveness and innovation quality. Digital technologies like IoT, big data, and AI improve environmental management by monitoring energy consumption, carbon emissions, and waste treatment in real-time. This helps enterprises comply with regulations, lead in green technology, and pave the way for green management innovation. Digital transformation also optimizes resource use, reducing energy and material waste through refined management. It enhances transparency and accuracy in environmental certification and disclosure, boosting market reputation and attracting green investments. By integrating digitalization with green innovation, enterprises reduce compliance risks, strengthen environmental responsibility, and improve innovation quality. This trend will be crucial for future development, fostering environmental products and services to excel in market competition. In summary, digital transformation advances green management innovation, improving environmental performance, market competitiveness, and indirectly enhancing innovation quality.

H3: The digital transformation of enterprises has indirectly improved the quality of enterprise innovation by improving green management innovation (comprehensive scoring with environmental supervision and certification and management disclosure).

### 3. Research Design

#### 3.1. Data source

This study selected listed and export companies in my country from 2017 to 2021 as research samples. The original data comes from the CSMAR database. Finally obtained 13002 data.

##### (1) Explained variables

The explained variables of this study are the quality of enterprise innovation. The number of invention patent authorizations from the 2017-2021 of my country's import and export companies is used to measure the number of natural numbers. The number of invention patents is an important indicator of the technological innovation capabilities of enterprises. It has high technical complexity and market competitiveness, which can effectively represent the innovative quality of enterprises.

In order to reduce the partiality of the data distribution and ensure the stability of the regression analysis, the number of natural pairs to the number of invention patents after 1 is plus 1, and the calculation formula is  $\text{LN}(\text{the number of invention patent authorization} + 1)$ . This processing method can not only smooth the data distribution, but also avoid the impact of zero value, make the measurement of enterprise innovation quality more accurate, and can better reflect the actual contribution of enterprises in terms of technological innovation.

##### (2) Explanation variable

The core interpretation variables of this study are the degree of digital transformation of enterprises, and the digital transformation indexes of my country's import and export listed companies in 2017-2021 are used as the measurement indicator. The index comprehensively reflects the performance of enterprises in terms of information technology application, digital management and intelligent production. The data comes from the Chinese securities market and accounting research database (CSMAR).

The higher the digital transformation index, the higher the degree of digitalization of an enterprise, which means that it has a high degree of maturity in the fields of information technology, management optimization and intelligent production. This article explores the impact of corporate digital transformation on innovation quality through this index, and analyzes the role of digitalization in improving corporate competitiveness.

##### (3) Moderating variables

The intermediary variables in this study are the structure of innovative personnel (RANDD) and green management innovation. The total number of R & D personnel in the structure of innovative personnel is measured to the total number of R & D personnel to the total number of company employees. Green Management Innovation refer to the study of Jia Guangyu and others [8], according to the environmental supervision and certification disclosure of the listed company of Guotaian Database, and the data listed in the listed company's management disclosure table, use the comprehensive score of 5 indicators Measure the green management innovation of enterprises. Specifically include: environmental management system; whether it has passed ISO14001 certification; whether it has passed ISO9001 certification; environmental education and training; environmental protection special action. To obtain a comprehensive score through the total, we can measure corporate green management innovation.

#### (4) Control variable

In order to improve the accuracy of model estimation and control other factors that may affect the innovation quality of enterprises, this paper introduces several control variables: Company Age (Age), company Size (Size), asset-liability ratio (lev), net profit rate on total assets (roa), return on equity (roe), total assets turnover (ato), equity nature (soe), equity concentration index (EqCone), company cash flow (OpCash). By controlling for these variables, research can more accurately reveal the true impact of digital transformation on the innovation quality of enterprises, reducing the interference of other factors.

## 4. Empirical results analysis

### 4.1. Description statistics

Table 1 is listed as a descriptive statistical result of 13002 observation values of 3012 listed companies. It can be seen from Table 1 that the average standard difference between the Innovation of Enterprise Innovation is 1.527821, which is large, indicating that there is a significant difference in innovation quality among enterprises; AGE average is 20.47579, SIZE average is 8.36e+10, the average value of the Lev is 0.451, the ROE average value is 0.004, the ATO average is 0.133, the average EQCONE is 33.138, the average value of the OPCASH is -8.97e+08 consistent with existing research.

Table 1: Main variable descriptive statistics.

| Variable   | Obs    | Mean      | Std. dev. | Min       | Max      |
|------------|--------|-----------|-----------|-----------|----------|
| innovation | 13,002 | 1.644     | 1.529     | 0.000     | 8.048    |
| digital    | 13,002 | 39.154    | 10.795    | 22.992    | 79.809   |
| age        | 13,002 | 20.476    | 6.181     | 3.830     | 71.250   |
| size       | 13,002 | 8.36e+10  | 1.04e+12  | 0.000     | 3.33e+13 |
| lev        | 13,002 | 0.451     | 0.309     | 0.010     | 11.386   |
| roa        | 13,002 | 0.034     | 0.130     | -1.872    | 4.489    |
| roe        | 13,002 | 0.004     | 1.985     | -174.895  | 14.021   |
| ato        | 13,002 | 0.133     | 0.132     | 0.000     | 3.066    |
| eqcone     | 13,002 | 33.138    | 14.729    | 3.003     | 89.991   |
| opcash     | 13,002 | -8.97e+08 | 1.07e+10  | -4.57e+11 | 3.11e+11 |

Note: Innovation adds a natural number for the invention patent authorization book.

### 4.2. Benchmark regression

The benchmark regression results are shown in Table 2. In Table 2 (1), the coefficient of DIGITAL is 0.026, and it is significant at a significant level of 1%. This indicates that there is a significant

positive relationship between digital transformation and the quality of corporate innovation, that is, as the level of digitalization increases, the innovation quality of enterprises will increase. Therefore, H1 assumes support. Column (2) The coefficient of digital transformation in the number of digital transformation in the enterprise is 0.507, and the coefficient of the proportion of the number of enterprises in the column (4) in the column (4) is 0.014 in the quality of the innovation of enterprises, and both are a significant level of 1%at 1%. Significantly, this indicates that the digital transformation of the enterprise has indirectly improved the innovation quality of the enterprise through improving the structure of innovative personnel. Therefore, H2 assumes support. In the column (3), the coefficient of digital transformation indicators (Digital) is significantly significantly, but the coefficient of the environmental supervision and certification and management disclosure in the column (5) is not significant. This shows that although digital transformation has a significant impact on the quality of enterprise innovation, environmental supervision and certification and management disclosure (green management innovation) have not significantly directly affected the quality of innovation. It is not possible to conclude that digital transitions indirectly improve the quality of innovation by improving green management innovation. Therefore, H3 assumes that it is not supported.

Table 2: Benchmark regression.

|                                    | (1)<br>innovation   | (2)<br>randd          | (3)<br>environment  | (4)<br>innovation   | (5)<br>innovation   |
|------------------------------------|---------------------|-----------------------|---------------------|---------------------|---------------------|
| digital                            | 0.026***<br>(0.003) | 0.507***<br>(0.011)   | -0.002*<br>(0.001)  |                     |                     |
| size                               | 0.000*<br>(0.000)   | 0.000***<br>(0.000)   | 0.000**<br>(0.000)  | 0.000***<br>(0.000) | 0.000<br>(0.000)    |
| lev                                | 0.788***<br>(0.158) | -8.201***<br>(0.480)  | 0.016<br>(0.036)    | 0.901***<br>(0.163) | 0.868***<br>(0.162) |
| roa                                | 0.890*<br>(0.454)   | -4.455***<br>(1.150)  | 0.743***<br>(0.089) | 0.543<br>(0.454)    | 0.555<br>(0.462)    |
| roe                                | 0.102<br>(0.148)    | 0.102<br>(0.108)      | 0.007<br>(0.005)    | 0.150<br>(0.148)    | 0.154<br>(0.151)    |
| ato                                | -0.161<br>(0.309)   | -13.065***<br>(0.963) | 0.192**<br>(0.075)  | 0.022<br>(0.316)    | -0.277<br>(0.317)   |
| eqcone                             | 0.009***<br>(0.002) | -0.114***<br>(0.008)  | 0.004***<br>(0.001) | 0.006***<br>(0.002) | 0.006***<br>(0.002) |
| opcash                             | 0.000***<br>(0.000) | 0.000<br>(0.000)      | 0.000**<br>(0.000)  | 0.000<br>(0.000)    | 0.000***<br>(0.000) |
| age                                |                     | -0.311***<br>(0.020)  | 0.001<br>(0.002)    | -0.001<br>(0.005)   | -0.008<br>(0.005)   |
| randd                              |                     |                       |                     | 0.014***<br>(0.002) |                     |
| environment                        |                     |                       |                     |                     | 0.019<br>(0.025)    |
| _cons                              | -0.051<br>(0.152)   | 12.438***<br>(0.722)  | 0.826***<br>(0.059) | 0.765***<br>(0.156) | 1.214***<br>(0.137) |
| Observations                       | 2684                | 11746                 | 12863               | 2679                | 2683                |
| R-squared                          | 0.057               | 0.227                 | 0.015               | 0.053               | 0.024               |
| Standard errors are in parentheses |                     |                       |                     |                     |                     |
| *** p<.01, ** p<.05, * p<.1        |                     |                       |                     |                     |                     |

### 4.3. Robustness check

In order to ensure the reliability of the research conclusion, the following stability test was conducted in this article: The Robustness Check-Poisson regression (1)-(5) and Robustness Check-Replace the dependent variable with the independent variable (6)-(7) result is as shown in Table 3.

Table 3: Robustness Check-Poisson regression and replace the dependent variable with the independent variable.

|                                    | (1)<br>innovation   | (2)<br>randd              | (3)<br>environment  | (4)<br>innovation   | (5)<br>innovation   | (6)<br>innovation   | (7)<br>innovation    |
|------------------------------------|---------------------|---------------------------|---------------------|---------------------|---------------------|---------------------|----------------------|
| digital                            | 0.026***<br>(0.003) | 0.499***<br>(0.012)       | -0.002*<br>(0.001)  |                     |                     | 0.061***<br>(0.000) | 0.068***<br>(0.000)  |
| size                               | 0.000**<br>(0.000)  | 0.000***<br>(0.000)       | 0.000*<br>(0.000)   | 0.000***<br>(0.000) | 0.000**<br>(0.000)  |                     | 0.000***<br>(0.000)  |
| lev                                | 0.953***<br>(0.173) | -7.157***<br>(0.506)      | -0.041<br>(0.038)   | 1.057***<br>(0.179) | 0.994***<br>(0.177) |                     | 2.911***<br>(0.019)  |
| roa                                | 1.183**<br>(0.499)  | -3.376***<br>(1.250)      | 0.555***<br>(0.095) | 0.867*<br>(0.499)   | 0.842*<br>(0.507)   |                     | 3.939***<br>(0.051)  |
| roe                                | 0.014<br>(0.156)    | 0.171<br>(0.133)          | 0.016*<br>(0.009)   | 0.054<br>(0.156)    | 0.053<br>(0.158)    |                     | 0.069***<br>(0.019)  |
| ato                                | 0.032<br>(0.325)    | -<br>12.674***<br>(1.068) | 0.221***<br>(0.082) | 0.121<br>(0.333)    | -0.125<br>(0.333)   |                     | -0.854***<br>(0.046) |
| eqcone                             | 0.014***<br>(0.002) | -0.126***<br>(0.009)      | 0.004***<br>(0.001) | 0.012***<br>(0.002) | 0.011***<br>(0.002) |                     | 0.009***<br>(0.000)  |
| opcash                             | 0.000<br>(0.000)    | 0.000**<br>(0.000)        | 0.000*<br>(0.000)   | 0.000<br>(0.000)    | 0.000<br>(0.000)    |                     | 0.000***<br>(0.000)  |
| age                                |                     | -0.334***<br>(0.022)      | 0.006***<br>(0.002) | 0.006<br>(0.005)    | 0.001<br>(0.006)    |                     | 0.009***<br>(0.001)  |
| randd                              |                     |                           |                     | 0.014***<br>(0.002) |                     |                     |                      |
| environment                        |                     |                           |                     |                     | 0.021<br>(0.028)    |                     |                      |
| _cons                              | -0.284*<br>(0.166)  | 13.131***<br>(0.793)      | 0.752***<br>(0.065) | 0.365**<br>(0.171)  | 0.788***<br>(0.151) | 0.558***<br>(0.015) | -1.739***<br>(0.026) |
| Observations                       | 2170                | 9401                      | 10285               | 2166                | 2169                |                     |                      |
| R-squared                          | 0.066               | 0.229                     | 0.013               | 0.054               | 0.032               |                     |                      |
| Observations                       |                     |                           |                     |                     |                     | 2717                | 2683                 |
| Pseudo R2                          |                     |                           |                     |                     |                     | 0.131               | 0.279                |
| Standard errors are in parentheses |                     |                           |                     |                     |                     |                     |                      |
| *** p<.01, ** p<.05, * p<.1        |                     |                           |                     |                     |                     |                     |                      |

### 4.4. Heterogeneity test

Table 4 shows the difference between the influence of various variables in different enterprises (state-owned enterprises and non-state-owned enterprises), the influence of various variables on "Innovation" (innovation) due to variables. The column (1) is a state-owned enterprise, and the digital transformation index coefficient is 0.045, and it is significant at a level of 1%, indicating that the degree of digitalization has a significant positive impact on innovation among state-owned enterprises. The age coefficient of the enterprise is -0.024, and it is significant at a level of 5%, which shows that among state-owned enterprises, the growth of corporate ages has a negative impact on

innovation, that is, older companies may face more challenges in innovation. The scale of the enterprise: The coefficient is 0, which means that among state -owned enterprises, the impact of enterprises on innovation is not obvious. The asset -liability ratio coefficient is 0.838, and it is significant at a level of 5%, indicating that among state -owned enterprises, higher financial leverage (that is, more debt financing) has a positive impact on innovation. Enterprises provide more funds for research and development and innovation. The impact of financial indicators such as total asset return, net asset yields, and overall asset turnover rate on innovation is not significant. The net asset yield is close to a 10%level, which may indicate that it has a weak positive impact on innovation. Essence equity concentration: The coefficient is 0.009, and it is significant at a level of 5%, indicating that among state -owned enterprises, the concentration of equity has a positive impact on innovation, that is, the more concentrated equity, the more conducive to innovation. The coefficient of operating cash flow is 0, but it is significant among non -state -owned enterprises, indicating that the impact of operating cash flow on innovation in state -owned enterprises is not obvious.

Column (2) is a non -state -owned enterprise with a digital transformation index coefficient of 0.02, which is significant at a level of 1%. Similar to state -owned enterprises, the degree of digitalization has a significant positive impact on the innovation of non -state -owned enterprises, but The degree of influence is slightly smaller. The age coefficient of the enterprise is 0, which shows that among non -state -owned enterprises, the impact of corporate age on innovation is not obvious, which is different from state -owned enterprises. The scale coefficient of the enterprise is 0.396, and it is significant at a level of 5%, indicating that among non -state -owned enterprises, the scale of enterprises has a significant positive impact on innovation, that is, the easier it is to innovate the larger the size. The asset -liability ratio coefficient is 1.012, and it is significant at a level of 5%, similar to state -owned enterprises, but it has a greater impact among non -state -owned enterprises, indicating that debt financing also has an important promotion effect on non -state -owned enterprises' innovation. The operating cash flow coefficient is 0.459, and it is significant at a level of 1%, indicating that among non -state -owned enterprises, operating cash flows have a significant positive impact on innovation. And innovation.

According to heterogeneous analysis, the degree of digitalization has a significant positive impact on innovation among two types of enterprises.

Among state -owned enterprises, the age of enterprises has a negative impact on innovation, while financial leverage and equity concentration have a positive impact on innovation; among non -state -owned enterprises, enterprises' scale and operating cash flow have a significant positive impact on innovation. There is a difference in impact on innovation among two types of enterprises in the two types of enterprises, indicating that different types of enterprises have different innovative strategies and resource utilization.

Table 4: Heterogeneity.

|         | (1)<br>State-owner<br>innovation | (2)<br>Private enterprise<br>innovation |
|---------|----------------------------------|-----------------------------------------|
| digital | 0.045***<br>(0.006)              | 0.020***<br>(0.003)                     |
| age     | -0.024**<br>(0.011)              | 0.000**<br>(0.000)                      |
| size    | 0.000***<br>(0.000)              | 0.396**<br>(0.174)                      |
| lev     | 0.838**<br>(0.385)               | 1.012**<br>(0.451)                      |

Table 4: (continued).

|                                    |                    |                     |
|------------------------------------|--------------------|---------------------|
| roa                                | -0.278<br>(1.403)  | -0.079<br>(0.147)   |
| roe                                | 0.788*<br>(0.45)   | -0.117<br>(0.365)   |
| ato                                | -0.308<br>(0.582)  | 0.003<br>(0.002)    |
| eqcone                             | 0.009**<br>(0.004) | 0.000***<br>(0.000) |
| opcash                             | 0.000<br>(0.000)   | 0.459***<br>(0.164) |
| _cons                              | -0.139<br>(0.438)  | 1929<br>0.033       |
| Observations                       | 755                |                     |
| R-squared                          | 0.127              |                     |
| Standard errors are in parentheses |                    |                     |
| *** p<.01, ** p<.05, * p<.1        |                    |                     |

## 5. Conclusion and Revelation

### 5.1. Research conclusion

On the basis of the study of digital transformation and the quality of innovation quality of the enterprise, the following conclusions are obtained by this study: Firstly, digital transformation significantly boosts enterprise innovation quality by introducing big data, AI, IoT, optimizing management, enhancing decision accuracy, and providing data support for innovation. Secondly, it improves innovation through better HR allocation, green management innovation, optimizing R&D resource allocation, and enhancing environmental management. Lastly, digital transformation's management changes and resource optimization are crucial for improving innovation quality, automating the innovation process, increasing market conversion, and enhancing overall innovation capabilities.

### 5.2. Research contribution

Firstly, digital transformation significantly impacts innovation quality from an enterprise internal management perspective, as traditional models face digitalization challenges. Digital technology reshapes organizational structures, processes, and decision-making, influencing innovation selection, implementation, and outcomes. Research on optimizing digital transformation for innovation quality can guide management improvement and sustain innovation efficiency in the digital era.

Secondly, this study is crucial for corporate practice and theoretical advancement. Practically, it aids managers in leveraging digital technology to optimize innovation processes and outcomes, informing digital transformation strategies for technology-management integration, enhancing innovative output and competitiveness. Theoretically, while much research focuses on technology's impact on corporate innovation, less attention is paid to innovation quality. Exploring digital transformation's influence on innovation quality through management optimization fills a research gap, deepening theoretical understanding and fostering a comprehensive framework for digital transformation and innovation.

Lastly, with a complex and evolving global economic environment, digital transformation is inevitable. Enhancing innovation quality through digital transformation is vital for enterprise survival, industry transformation, and national economic development. Studying this topic helps companies capitalize on digital opportunities for sustainable innovation and growth.

### 5.3. Practice Revelation

This research provides key insights for companies aiming to enhance innovation quality through digital transformation, offering a solid foundation for policymakers. It emphasizes the importance of increasing investment in digital infrastructure, such as IT upgrades, data management platforms, IoT, and AI, to improve information flow, dismantle "information islands," and foster both internal management efficiency and overall innovation quality. Additionally, the research advocates for the introduction of intelligent tools, including big data analysis and decision-making systems, to optimize decision-making processes and mitigate the uncertainty associated with subjective judgments. Cultivating digital management skills is also crucial to adapt to evolving market demands. Furthermore, the research underscores the need to optimize R&D staffing through digital methods and establish a digital talent management system, while strengthening R&D training to prepare for future technological needs. Implementing green management practices using digital technology is another key aspect, aiming to enhance environmental transparency and efficiency by leveraging IoT and monitoring systems to track energy use and optimize resource utilization. Collaborative innovation is also highlighted, emphasizing the need to strengthen collaboration among supply chains, partners, and research institutions through digital platforms to share technology, resources, and ultimately enhance innovation outcomes. Lastly, the research emphasizes the formulation of digital transformation strategies that are aligned with industry and resource conditions, setting clear goals, phased results, and allowing for flexible adjustments based on market and technological advancements.

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