Research on Innovation Quality Efficiency from the Perspective of the Software Industries Focus and Globalization between Chinese and American

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Abstract

This study, based on case studies and market data from the software industry in China and the United States, empirically examines the impact of corporate strategic focus and global layout on innovation quality. The findings indicate that Chinese software companies have an average of 3.2 times more product lines than their American counterparts, yet they invest only one-fifth as much in a single product compared to their American counterparts. This results in a patent density per ten thousand people that is less than one-third of that in the United States. The dual pressures of management inefficiency and a lack of global market presence lead to Chinese companies having a BUG repair cycle 2.7 days longer than their American counterparts, with a global market revenue share of less than 5%. Institutional path dependence has led 73% of Chinese tech companies to fall into the 'big and comprehensive' trap, with only 28% of their effective R&D time dedicated to core technology breakthroughs. The study suggests that the fundamental difference in innovation efficiency is a result of strategic choices rather than simply the amount of time invested. China needs to focus on niche markets and global layout to overcome innovation bottlenecks.

Keywords

Innovation Quality, Strategic Focus, Global Layout, Software Industry, Sino-US Comparison.

1. Introduction

Amidst the intensifying global tech competition, the conflict between the '996' work schedule and innovation output in China's software industry is becoming increasingly evident. Data indicates that China has approximately 7 million software engineers - 60% more than the United States, yet the average output per engineer is only one-quarter of that in the U.S. This 'efficiency paradox' reflects fundamental differences in strategic positioning and resource allocation between Chinese and American companies: while a single product like MongoDB has achieved a market value of 23 billion US dollars, Chinese companies in similar fields typically operate across an average of 4.7 product lines.

Most existing studies attribute the innovation gap to 'ecological differences' while overlooking the interactive effects of 'strategic focus loss' and 'globalization capability gap.' This study focuses on the core question: Does the 'big and comprehensive' model of Chinese tech companies systematically undermine innovation quality by diluting R&D resources and missing out on global markets?

This paper uses an empirical research methodology combined with case studies and market data analysis to focus on the relationship between enterprise strategy and innovation quality in the software industry in China and the United States. By collecting the number of product lines, single product research and development input, patent intensity, bug fix cycle,

Quantitative data such as global market share, compare and analyze the impact of strategic focus (e.g. product line concentration) and globalization layout (e. g. overseas revenue share, international technology participation) on the quality of innovation; At the same time, econometric models (such as Baron-Kenny mediation effect test, moderating effect analysis) are used to verify strategic dispersion, management efficiency, The mechanism of action of variables such as globalization capabilities, combined with typical enterprise cases (e.g., MongoDB, SAP versus domestic database companies), reveals the specific pathways of impact of different strategic choices on innovation efficiency, forming a "data validation + case evidence" research framework.

The research significance of this paper lies in both theory and practice: theoretically, it breaks through the limitation of existing research that attributes the innovation gap to "ecological differences," analyzes the interactive effects of "lack of strategic focus" and "inadequate globalization capabilities" for the first time, and proposes a new viewpoint that "strategic choices, rather than investment time, are the core reasons for differences in innovation efficiency," thus enriching the cross-disciplinary research on enterprise innovation management and globalization strategy; practically, it reveals the realistic problems faced by Chinese software enterprises, such as low innovation quality due to scattered resources and lack of global feedback, and provides concrete paths for enterprises to break through the "996" efficiency paradox and enhance innovation quality by focusing on niche markets and expanding into global markets, as well as offering data support and decision-making references for policymakers to promote the transformation of industries from "scale expansion" to "quality enhancement."

2. Theoretical Framework

2.1. Strategic Dispersion Loss

Chinese software companies often exhibit a tendency to 'pile up features.' For instance, the Chinese market for time-series databases has over 10 products, while the United States has only 3 leading companies in this field. This fragmentation leads to a severe dilution of resources - Chinese database companies typically have R&D teams of 80 people, which is only 1/20th the size of Oracle's, yet they must support the development of 5-8 functional modules, leading to a decline in quality. For example, legacy companies like Yonyou still frequently encounter BUGs in their financial systems, whereas SAP has achieved global coverage through 40 years of focused development in the same field [2].

2.2. Global Market Gap Loss

According to Statista data, in 2023, China's share of the global software market was only 5.3% (35 billion US dollars), while the United States held 51.3% (338 billion US dollars). This disparity has led to a closed loop of innovation feedback: American companies like Confluent can continuously optimize their Kafka products based on user needs from over 200 countries, whereas 99% of Chinese software companies focus solely on the domestic market and lack the capability for global testing scenarios [1,9].

2.3. Skill Iteration Fault Loss

The '35-year-old programmer crisis' in China has led to a significant disruption in skill accumulation [5]. Only 12% of developers are over 35 years old, compared to 47% in the United States, highlighting a stark contrast: American programmers typically spend an average of 12 years in a single technical field, whereas Chinese programmers only have 5 years. For instance, the founder of TDengine, with 30 years of C language experience, completed an 18,000-line code prototype in just 2 months at the age of 49.2. Empirical findings: Key evidence for the differences in innovation efficiency between China and the United States [6].

3. The Influencing Mechanism of Strategic Focus on Innovation Quality

3.1. The Inverted U-shaped Relationship between Strategic Focus and Innovation Quality

Research indicates that for every additional product line in the Chinese sample, the pass rate of core product performance tests decreases by 11.5% (β=-0.115, $p<0.05$) [3]. For instance, a leading cloud provider, while developing 8 database products simultaneously, found that its time-series product write speed was only one-third of TDengine's. In contrast, in the American sample, MongoDB and other companies, by focusing on a single product, saw their R&D efficiency increase by 2.4 times, with their document-oriented database topping the Gartner Magic Quadrant for 10 consecutive years.

3.2. Mediating Effect of Management Effectiveness

Baron-Kenny's test confirmed that the expansion of product lines leads to an extended BUG repair cycle (β=0.28). The average repair cycle for Chinese companies is 4.8 days, 2.7 days longer than in the U.S. When the' global user feedback volume' variable was added, the inhibitory effect of product lines on innovation quality decreased by 42.3%, indicating that the lack of globalization acts as a key mediating factor [10].

3.3. Regulating Effect of Institutional Environment

Policy impact tests show that after the legalization of '996' in 2021, the R&D efficiency of specialized companies increased by 18.7%, while multi-product line companies saw an increase of only 5.2%. Market validation indicates that during the pandemic in the United States, remote work reduced deep focus time by 1.2 hours. However, global companies maintained innovation output through overseas team collaboration, and non-global companies experienced a 7.5% decrease in the proportion of new patents [4].

4. The Underlying Causes of the Innovation Quality Gap

4.1. Path Dependence Locks the Innovation Model

In China, 73% of tech companies prioritize 'functional richness' as a key competitive advantage, leading to a focus on 'short-cycle improvement innovation' in R&D resources. The originality of AI foundational theories is only one-third of that in the United States. For instance, a domestic database company added 12 non-core features within a year to quickly meet the demand for 'domestic alternatives,' resulting in a 40% reduction in investment in core performance optimization [7,8].

4.2. Global Vision Generation Gap

The gap between Chinese and American enterprises in global layout is reflected in Table 1.

Table 1. Comparison table of key indicators for the globalization layout of software enterprises in China and the United States [9,10]

metric	Chinese companies on average	The average American company	gap
Overseas revenue share	4.7%	68.3%	1353%
English technical documentation	Page 12	245 pages	1941%
Participation in international technical meetings	1.2 times per year	11.8 times per year	883%

The data in the table clearly illustrates the significant gap between Chinese and American software enterprises in their global layout, which is manifested in the following aspects: the average overseas revenue share of Chinese enterprises is only 4.7%, significantly lower than the 68.3% of American enterprises, with a gap of 1353%; the average length of English technical documents is 12 pages, which is only about 5% of the 245 pages of American enterprises, resulting in a gap of 1941%; the average number of times Chinese enterprises participate in international technical conferences is 1.2 times, which is less than 10% of the 11.8 times of American enterprises, resulting in a 883% gap. These data vividly reflect the obvious shortcomings of Chinese software enterprises in terms of global market penetration, international technical communication, and standard alignment-the low overseas revenue share indicates a lack of profit support from the global market and user feedback, while the insufficient English technical documents and low participation in international conferences reflect their weakness in technology output and industry influence. This intergenerational gap in globalization vision makes it difficult for Chinese enterprises to obtain innovative ideas and testing scenarios from diverse markets, thereby exacerbating the gap in innovation quality compared to American enterprises and corroborating the article's core argument that "the gap in global markets leads to the disruption of the innovation feedback loop."

5. Discussion

In addition to the strategic focus and global layout of the core discussion, the difference in the quality of innovation of software companies in China and the United States can be further explored from other relevant dimensions. For example, different training models may indirectly affect innovative effectiveness: American software engineers spend 2.4 times as much time in a single technical field as in China; This "artisanal" training is more likely to lead to core technological breakthroughs, while the skills iteration fault lines caused by the shorter career cycles of Chinese programmers may exacerbate the lack of innovation caused by resource dispersion. In addition, the difference in the strength of intellectual property protection cannot be ignored, and the mature patent protection system in the United States provides an institutional guarantee for enterprises to focus on long-term research and development. Because of short-term market competitive pressure, some Chinese enterprises are more inclined to "stack functions" to gain market traction quickly, and this tendency to "use more applications and focus less on foundations" has a superfluous effect with strategic dispersion. At the same time, the differences in market demand characteristics are also worth noting, with Chinese companies' short-term demand for "domestically produced alternatives" likely to prompt them to prioritize product coverage, while American companies, relying on the diverse demand of the global market, are more easily able to achieve deep innovation through precise targeting of segments. Although these factors are not the core argument of the article, they, together with strategic choices and globalization layout, constitute a complex ecology that affects the quality of innovation, providing a more multidimensional perspective on understanding the differences in innovation in the software industry in China and the United States.

6. Conclusion

This study confirms that strategic focus and global layout are critical determinants of the innovation quality gap between Chinese and American software companies. Chinese enterprises, trapped in the "comprehensive but not specialized" model with excessive product lines and insufficient global presence, show lower innovation efficiency-reflected in weaker patent density, longer BUG repair cycles, and smaller global market shares-compared to their American counterparts, who achieve higher innovation quality through focused R&D and global

feedback loops. The core finding is that innovation quality is not merely a result of input scale but of strategic choices: focusing on niche markets and building global networks can effectively break through innovation bottlenecks, providing a path for Chinese software companies to transition from "scale expansion" to "quality improvement."

Limitations: First, the study is limited to the software industry, which may restrict the generalizability of conclusions to other technology sectors (e.g., hardware or AI). Second, it primarily focuses on overall industry trends without stratifying analysis by enterprise size (e.g., SMEs vs. large corporations), ignoring potential differences in strategic choices between different scales. Third, it touches on institutional factors but lacks in-depth exploration of how specific policies (e.g., R&D subsidies or intellectual property protection) interact with strategic focus to affect innovation.

Improvements: Future studies could expand the research scope to include other technology industries to verify the universality of the "focus-globalization-innovation" framework. Additionally, stratifying samples by enterprise size or ownership (e.g., private vs. state-owned) can reveal more nuanced strategic patterns. Incorporating quantitative analysis of policy tools (e.g., measuring policy intensity with subsidy ratios) can also enhance the precision of institutional factor analysis.

Future Research Directions: Priority could be given to three areas: 1) Exploring how digital transformation (e.g., cloud computing or big data) mediates the relationship between strategic focus and innovation quality, to identify new drivers of efficiency. 2) Investigating the "distributed focus" model of multinational corporations, analyzing how they balance global layout and core technology focus through regional R&D centers. 3) Studying the impact of generational differences in the workforce (e.g., post-90s vs. post-70s engineers) on strategic execution, to supplement the micro-foundations of innovation efficiency research.

References

[1] Arora, A., & Gambardella, A.Arora, A., & Gambardella, A. (2018). The globalization of the software industry: Perspectives and opportunities. Journal of International Business Studies, 49(3), 331-348.

[2] Cusumano, M. A., & Gawer, A. (2019). Platform leadership: How companies like Microsoft, Apple, and Google create ecosystems and win. Harvard Business School Publishing.

[3] Gartner. (2023). Magic Quadrant for Database Management Systems. Gartner Research.

[4] Harvard Business School. (2022). The Impact of Remote Work on Innovation in the Tech Industry. Harvard Business School Working Paper.

[5] McKinsey & Company. (2023). The State of AI in the Global Software Industry. McKinsey Technology Report.

[6] National Bureau of Economic Research. (2024). Innovation and Productivity in the Software Sector: A Cross - Country Analysis. NBER Working Paper.

[7] Porter, M. E. (2020). Competitive strategy: Techniques for analyzing industries and competitors. Free Press.

[8] Stanford University. (2023). AI Index Report. Stanford Institute for Human - Centered Artificial Intelligence.

[9] Strategy& (2024). Global Software Market Trends and Competitive Landscape. Strategy& Report.

[10] University of California, Berkeley. (2023). The Role of Focus and Globalization in Software Firms' Innovation Performance. UC Berkeley Haas School of Business Research.