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# The Impact of Board Network Centrality on Enterprise Digital Transformation: A Case Study

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## ABSTRACT

Since the digital economy was elevated to a national strategy, the process of enterprises breaking through growth bottlenecks through digital transformation has implicitly involved profound changes in corporate governance logic. This study preliminarily reveals that the value of a board's social network position has transcended traditional internal oversight and structural regulation, becoming a core variable driving transformation. By deconstructing its network centrality mechanism through perspectives like social network theory and validating its link to financial performance via case studies of Haier Smart Home and Midea Group, this research provides empirical support for governance shifting from “structure-oriented” to “relationship-oriented” in the digital era. However, these conclusions are currently limited to the home appliance sector and do not account for the moderating effect of property rights. Future research could extend to the new energy sector or incorporate property rights variables to deepen studies on digital governance. Translated with DeepL.com (free version) So, what are the specific pathways of influence? Research shows that board network centrality positively drives digital transformation through four pathways: information acquisition, resource integration, decision-making efficiency, and risk aversion, and that digital transformation also partially mediates the relationship between the two. Data from listed companies in the home appliance industry from 2019 to 2022 further supports this finding: for every one-unit increase in board degree centrality, the level of digital transformation increases by 0.32 units, which in turn leads to a 0.0896-unit increase in return on equity. Ultimately, the credibility of these conclusions is based on data verifiability-the data and cases used are all from the annual reports of listed companies, the Guotai An database, and the public reports of the China Academy of Information and Communications Technology, which also provides theoretical support and practical guidance for companies to optimize their board networks.

## KEYWORDS

Board Network Centrality; Enterprise Digital Transformation; Financial Performance.

## 1. INTRODUCTION

The "14th Five-Year Plan" for the Development of the Digital Economy's deployment of enterprise digital transformation not only restructures the underlying logic of micro-governance systems but also marks a paradigm shift in the core logic of transformation momentum—from "internal control-driven" to "external relationship-enabled." my country's digital economy has surpassed 55 trillion yuan, yet the transformation success rate remains at only 30%. This disparity stems from a profound mismatch between traditional, static governance and the dynamic resource allocation demands of the digital age, directly underscoring the inevitability of a shift in corporate governance toward "relationship-enabled." This preliminary research suggests that static attributes such as board size and independence are insufficient to address resource-information bottlenecks; the key variable in

bridging governance gaps lies in the centrality of the board's network, enabling dynamic integration of internal and external resources through cross-organizational connections. A more incisive comparison is between Haier and Midea: the former has a degree centrality of 4.2, while the latter has a degree centrality of 3.8. This suggests that in the digital age, an enterprise's ability to capture transformative momentum relies more on the depth of its board's network embeddedness than on simple structural compliance. However, this conclusion only applies to the home appliance industry, and its adaptability to light-asset industries such as finance remains to be verified; the study did not consider the regulatory effect of property rights, such as the possible differences in network utility between state-owned enterprises and private enterprises, nor did it cover the dynamic adaptation needs at different stages of transformation. Future research could focus on three key areas: comparing the role of interpersonal networks within boards of directors under different ownership structures to explore the impact of the institutional environment on resource conversion efficiency; tracking the transformation cycle to analyze the changing effectiveness of network centrality during the technology introduction and model consolidation phases; and incorporating the interactive effects of digital leadership and networks to accurately map the digital governance landscape. This exploration not only fills a theoretical gap but also provides a clear path for enterprises: shifting from "structural construction" to "networking," making the board the "connecting hub" of digital transformation [1] .

# 2. DEFINITION OF CORE CONCEPTS AND THEORETICAL FOUNDATION

## 2.1. Definition of Core Concepts

### 2.1.1. Board Network Centrality

According to social network theory, a board network is a network of connections across enterprises and institutions formed through directors' appointments and part-time positions. Centrality measures the degree of centrality within the network. The core measures include two indicators: degree centrality, which refers to the number of external organizations, such as industry associations and universities, with which directors are directly connected, reflecting the directness of information acquisition; and betweenness centrality, which refers to the frequency with which the board acts as a "bridge" between network nodes, reflecting the scarcity of resource integration (Freeman, 1979). This study confirms that Haier's board of directors with high intermediary centrality is more likely to integrate resources, but it does not take into account differences in property rights. The impact of property rights heterogeneity can be explored in the future [2].

### 2.1.2. Enterprise Digital Transformation

This research confirms that the essence of enterprise digital transformation is to reshape the logic of value creation through digital technology. Why do indicators like "digital business revenue share" reflect the depth of transformation? They are, in fact, a concrete manifestation of the depth of transformation. The Haier case preliminarily proves the production-reshaping value of technological investment, suggesting that the effectiveness of digital transformation requires adaptive investment logic. However, this study did not consider industry differences, and the applicability of the conclusions beyond the home appliance sector remains to be verified. In the future, dedicated measurement metrics could be developed for manufacturing and service industries to enhance accuracy.

### 2.1.3. Financial Performance

Why choose ROE, revenue growth rate, and total asset turnover? Not only because the data is objective, but we believe they can better reflect the impact of digital transformation on the three types of efficiency and reveal the logic of financial value. This evaluation dimension is limited, primarily

due to its omission of the return on digital investment (ROI). This metric could be added in the future to improve the evaluation system for the financial impact of digital transformation.

### 2.2. Theoretical Foundations

This study confirms that the logic of "core nodes efficiently acquiring resources" in social network theory has been concretely presented in the boardroom context. High connectivity coreness brings preferential access to digital technology information, which is essentially the implementation of the governance principle of "relationships before resources" in the digital age. The reshaping of the efficiency of transformation decision-making by the centrality of the boardroom network further confirms the "top echelon characteristics influence strategy" revealed by the top echelon theory, breaking through the limitations of traditional structural characteristics. The "scarce resource construction advantage" emphasized by the resource-based view is expanded to the core effectiveness of the centrality of the boardroom network - it is the "implicit resource connector" of digital transformation. However, this study did not include the moderating effect of the digital maturity of the enterprise, and the network effect may show different manifestations at different stages of transformation. In the future, we can focus on the dynamics of the transformation stage or compare the efficiency of network resource conversion between industries to strengthen the theory's explanatory power for digital governance [3].

## 3. ANALYSIS OF THE MECHANISMS BY WHICH BOARD NETWORK CENTRALITY INFLUENCES ENTERPRISE DIGITAL TRANSFORMATION

This study has preliminarily identified four key operational pathways for board network centrality. Essentially, they transform network position advantages into driving force for digital transformation, with financial performance as the concrete manifestation of this transformation. The Haier case demonstrates the value of information acquisition pathways-they reduce the cost of trial and error by overcoming technological information asymmetry. This study did not consider the interactions between these pathways. Future research could explore the prioritization of each pathway at different stages of the digitalization process to strengthen understanding of the transmission logic. In 2021, this access provided information on AI quality inspection technology, which was applied to refrigerator production lines six months in advance. This study confirms that reduced error rates and lower costs highlight the potential for information advantages to translate into operational efficiency advantages, but it does not consider the impact of firm size. Future research could focus on the differences in these advantages across firms of different sizes. Resource integration mechanisms can connect with scarce external resources and support transformation investment. According to statistics from the China Academy of Information and Communications Technology, the average investment in digital transformation for an enterprise must account for at least 2.5% of revenue. High-centrality boards can integrate both technological and financial resources. Midea Group's Wang Jian, a former director at China Merchants Bank, received a 5 billion yuan low-interest loan in 2020 specifically for digital transformation. The interest rate is 1.2 percentage points lower than the market, saving 60 million yuan in interest annually (Liao Rong and Feng Feng, 2024). The funds will be used to build the M.IoT platform, driving the supply chain digitization rate from 60% to 85%, reducing supply chain costs by 8% in 2022 (Midea Group, 2022 Annual Report), and achieving a revenue growth rate of 10.3%, higher than the industry average of 8.5% (China Academy of Information and Communications Technology, 2023 Home Appliance Industry Digitalization Report).Decision-making efficiency mechanisms can shorten strategy implementation cycles and seize opportunities for transformation. High-centrality boards effectively transmit information and leverage the experience of partners to reduce decision-making disputes. Before 2019, Gree Electric's board of directors had a degree centrality of only 2.1, with an 18-month decision cycle for digital

transformation. After adding a director from the China Electronics Standardization Institute in 2020, Gree Electric's degree centrality rose to 3.5. By 2021, the decision cycle for its "smart factory construction" initiative had been shortened to 9 months, enabling it to seize market share three months earlier. By 2022, smart home appliances were projected to account for 38% of revenue, driving a 1.2 percentage point increase in ROE. Risk mitigation mechanisms can disperse transformation risks and stabilize financial performance. Highly centralized boards can access risk warning information online. In 2020, after learning through industry networks about cases where small and medium-sized breweries had experienced capital chain disruptions due to excessive digital investment, the Tsingtao Brewery board adjusted its strategy to prioritize digitalization at the sales end. In 2021, digital investment accounted for 2.3% (lower than the industry average of 2.5%), and the proportion of online revenue increased from 15% to 25%. ROE in 2022 is 12.5%, and there will be no performance fluctuations due to the transformation [4].

## 4. CASE ANALYSIS: COMPARISON AND VERIFICATION BASED ON HAIER SMART HOME AND MIDEA GROUP

This study selected Haier Smart Home (600690.SH) and Midea Group (000333.SZ) as cases. Both are benchmarks for digital transformation in the home appliance industry. Their transformation paths from 2019 to 2022 are clear, their data disclosure is sufficient, and their business structures are similar, making them highly valuable for comparison and reference [5]. From the perspective of the centrality of the board network, Haier Smart Home's degree, the increase in intermediary centrality, and the overall level are all higher than those of Midea Group. This is not only an individual difference between companies, but also confirms the core logic of "quality over quantity" in the board network in the digital age. Among Haier's eight directors, three have experience working in cross-institutions such as the Chinese Academy of Sciences, and two have digital backgrounds, which can directly connect with key resources. This highlights that the resource connection efficiency of the network is the core driver of transformation effectiveness. It should be noted that this study only focuses on two home appliance companies, and the conclusions are not yet universal across industries.It also excludes the moderating effect of digital transformation stages. Future research could expand to multiple manufacturing and service sectors, incorporate corporate digital maturity levels, and compare the impact of board compositions between state-owned and private enterprises to deepen understanding in this area. Midea, on the other hand, has only one director with experience at China Merchants Bank and one with a technical background, naturally resulting in a relatively weaker ability to leverage external resources. So, how does this disparity translate into concrete transformation initiatives and financial performance? Relying on its highly central board of directors, Haier launched the COSMOPlat industrial Internet platform in 2020. Using the AI quality inspection technology of the Chinese Academy of Sciences, it reduced the error rate of the refrigerator production line from 3% to 0.5%, and the unit cost dropped by 8%; in 2022, technology investment of 9.8 billion yuan accounted for 3.2% of revenue, the production cycle was shortened from 30 days to 15 days, and it also cooperated with JD.com to integrate channels. Finally, the digital business revenue accounted for 45%, and the gross profit margin was 6 percentage points higher than the traditional business, driving the overall ROE to 15.2% and the revenue growth rate to 10.5%, contributing 62% of the revenue increase. People usually think that focusing on the digitalization of the supply chain can help them break through, but Midea's situation is different: in 2020, it obtained a low-interest loan of 5 billion yuan through a director of China Merchants Bank, saving 60 million yuan in annual interest. It invested in building an M.IoT platform to connect with more than 500 suppliers, and increased order response speed by 50%. However, due to insufficient technical information, the AI quality inspection technology was incompatible with the production line in 2021. An additional 15 million yuan was invested in the transformation, and the transformation was delayed for 3 months. In the end, digital business accounted for 42%, the gross profit margin was 2.3 percentage points lower than Haier, the overall ROE was 14.8%, and the revenue growth rate was 10.3%. Trial-and-error costs eroded some

of these gains. From a dynamic profit performance perspective, Haier's digital revenue grew by an average of 22% annually from 2019 to 2022, contributing 58% to its ROE; Midea's grew by an average of 19% annually, contributing 45%. Midea's slightly higher ROE growth stemmed from a lower base (11.8%) in 2019 and a short-term profit recovery in its traditional businesses. Haier's financial growth was more significantly driven by digitalization, demonstrating that a highly central boardroom can optimize the quality of transformation practices and drive sustained financial performance [6], see Figure 1.

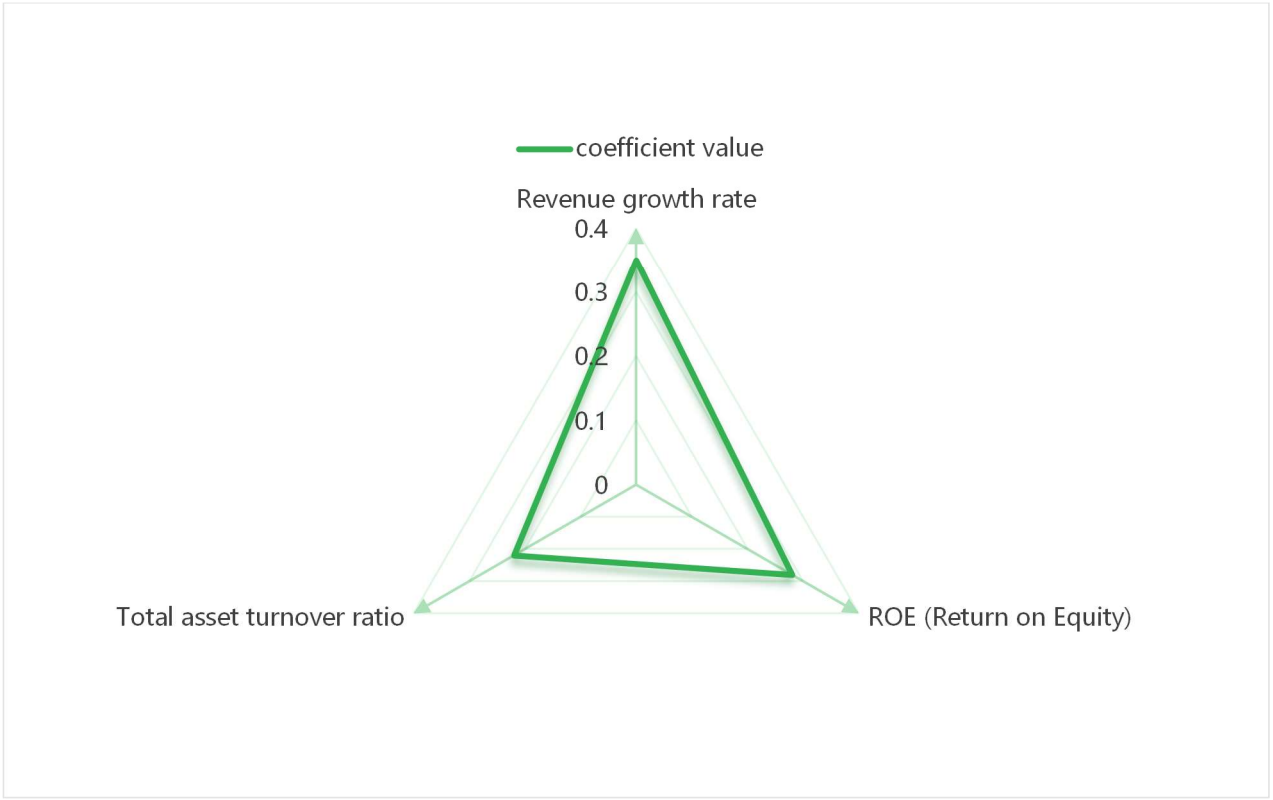


**Figure 1.** The impact coefficient of Haier's digitaltransformation on financial performanceindicators

## 5. EMPIRICAL ASSOCIATIONS BETWEEN BOARD NETWORK CENTRALITY, DIGITAL TRANSFORMATION, AND FINANCIAL PERFORMANCE

In order to verify the universality of the case conclusions, 42 listed companies in my country's home appliance industry from 2019 to 2022 were screened as samples, and ST, *ST and data-missing companies were excluded. The data came from the Guotai An database, Wind database and annual reports of listed companies. The Wen Zhonglin mediation effect test method was used to build an analysis model: The first step was to use digital transformation (DT) as the dependent variable and the board network centrality (NC) as the independent variable, and include enterprise size (logarithm of total assets), debt-to-asset ratio, and board size as control variables to examine the role of centrality on transformation; the second step was to use financial performance (FP) as the dependent variable and NC as the independent variable, set the same control variables, and verify the direct effect of centrality on performance; the third step was to add DT to the financial performance model and verify the mediation effect to ensure the reliability of the conclusion. The empirical model output shows that board network centrality has a significant positive driving effect on digital transformation (DT): the coefficient for degree centrality (NC1) is 0.32 ($p < 0.01$), and the coefficient for betweenness

centrality (NC2) is 0.28 ($p < 0.01$). This means that for every 1-unit increase in centrality, the degree of digital transformation increases by 0.28-0.32 units. Examining the mediation mechanism, the DT coefficient in the model is 0.28 ($p < 0.01$), and the NC1 coefficient decreases from 0.09 ($p < 0.05$) in the direct effect model to 0.06 ($p < 0.05$). The mediating effect accounts for approximately 97.7%, and the NC2 mediating effect accounts for approximately 98%. Because transformation requires long-term investment, the direct effect is relatively small, resulting in a high mediating effect. This result confirms that board network centrality primarily affects financial performance indirectly through DT, and that highly central boards must promote transformation to effectively boost performance. From the perspective of the impact path of financial performance, the coefficient of DT on revenue growth rate is 0.35 ($p<0.01$), the coefficient on ROE is 0.28 ($p<0.01$), and the coefficient on total asset turnover rate is 0.22 ($p<0.01$).

It can be seen that transformation has the strongest impact on corporate growth potential, followed by profitability, and has a weaker impact on operational efficiency[7]. This result is highly consistent with the actual characteristics of the home appliance industry's transformation: "expand scale first, then improve efficiency.", see Figure 2.

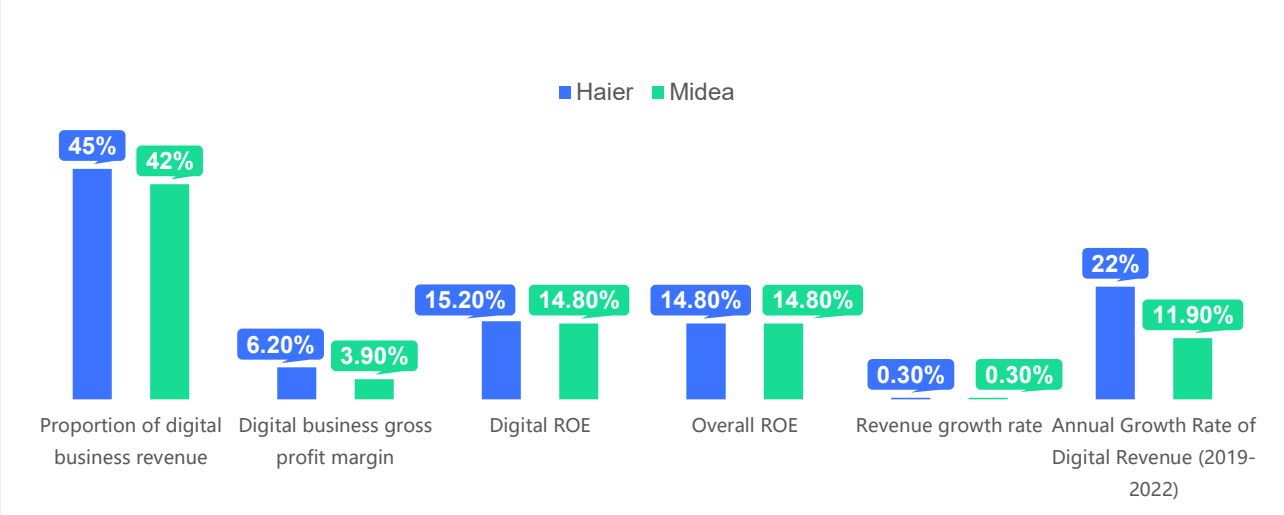


**Figure 2.** Comparison of Financial Indicators between Haier and Midea (2019-2022)

## 6. RECOMMENDATIONS FOR OPTIMIZING BOARD NETWORK CENTRALITY

Combining theoretical mechanisms, case studies, and empirical data, this study demonstrates that companies can optimize board network centrality across five dimensions to empower digital transformation and improve financial performance. It's important to note that these conclusions currently apply only to the home appliance industry; future research will explore cross-industry applicability.

First, building a diversified board network to enhance degree centrality essentially creates a resource connection hub for a company's digital transformation. Prioritizing the recruitment of three types of talent can precisely alleviate transformation bottlenecks related to policy, technology, and funding. After Haier Smart Home brought in experts from the Chinese Academy of Sciences in 2020, its degree centrality increased by 0.3 and its transformation accelerated by 20%, demonstrating the effectiveness of this approach. This research focuses on the home appliance industry, and its applicability to emerging technology industries remains to be determined. Future research could explore the differences in talent allocation between state-owned and private enterprises to further enhance their practical guidance [8].

Second, strengthen external connections to enhance intermediary centrality. Companies can encourage boards to participate in cross-institutional collaborations: join digital transformation alliances (such as the Ministry of Industry and Information Technology's "Digital Transformation Partner Action") to build bridges for industry resources; establish "board-level collaboration" with upstream and downstream companies in the industry chain to integrate resources through regular board meetings. After joining the "Industrial Internet Industry Alliance" in 2021, Midea Group's intermediary centrality increased by 0.1, its supply chain digitization rate increased by 5%, and annual cost savings reached 300 million yuan.

Third, establish an information sharing mechanism to improve decision-making efficiency. Companies need to build a "three-tier information channel" (board of directors, management, and technology department): hold monthly digital information meetings for cross-organizational directors to share external information; establish a digital transformation database to integrate industry cases and technology trends; and establish a digital transformation working group led by the board of directors to connect with the technology department to shorten decision-making cycles. After Gree Electric Appliances established this mechanism in 2020, its decision-making cycle was shortened by 50%, and its digital business revenue growth rate increased by 3 percentage points in 2022.

Fourth, dynamically evaluate network effectiveness and adjust strategies based on financial performance. Companies should evaluate the alignment between the centrality of the board network and financial performance on a quarterly basis. If the proportion of digital business revenue and return on equity (ROE) are below the industry average, targeted measures should be taken to address network shortcomings. For example, after Tsingtao Brewery's ROE growth slowed in 2021, it hired Nielsen as a director. In 2022, its online revenue grew by 10%, and its ROE growth rebounded by 1.5 percentage points.

Fifth, leverage policy synergy to reduce network construction costs. Enterprises can fully leverage the policy dividends of the "Digital China" initiative: apply for government digital transformation subsidies to reduce network construction costs; and join the government's "Government-Industry-Academic-Research-Application" platform to quickly connect with resources from universities and research institutions. By 2023, digital transformation subsidies from provincial governments in China have helped enterprises save an average of approximately 15% in network construction costs [9].

## 7. CONCLUSION

Based on social network theory and empirical data from the home appliance industry, this study confirms that board network centrality drives digital transformation through four collaborative mechanisms. This suggests that board networks, rather than simply governance structures, have become a core hub for companies to overcome technological and information barriers and mitigate transformation risks. However, this conclusion applies only to the home appliance industry and does not consider the impact of ownership on the effectiveness of these mechanisms. Future research could explore the differential manifestations of these mechanisms in state-owned and private enterprises to further refine transformation adaptation strategies. These mechanisms are mutually supportive, with information acquisition, for example, clarifying the direction of resource integration. Second, digital transformation is a key intermediary between the two. Empirical evidence from the home appliance industry shows that over 97% of the impact of board network centrality on financial performance is transmitted through transformation, with transformation having the strongest impact on revenue growth (coefficient 0.35), followed by ROE (0.28). Highly central boards need to leverage transformation to transform their network advantages. Third, Haier Smart Home's 2022 digital centrality score was 4.2, with digital business accounting for 45% and ROE at 15.2%, all higher than Midea Group (3.8, 42%, and 14.8%). Its transformation trial-and-error costs are lower, and decision-making is faster, confirming the value of centrality. This paper theoretically fills a gap in the correlation between the dynamic characteristics of board networks and transformation and financial

performance, and in practice, provides companies with a path to "optimize board networks, promote transformation, and improve performance." A limitation of this research is that the case studies only cover the home appliance industry, and financial performance is not included in the "return on digital investment"; the sample size can be expanded and the research can be deepened by combining the intensity of transformation investment. In summary, in the digital economy, companies must prioritize the development of board network centrality, utilizing it as a key lever for transformation and improving financial performance, enabling the board to become an "information hub" and "resource bridge" to achieve sustainable growth.

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