

Article

The Impact of Digital Transformation on the High-Quality Development of Enterprises: An Exploration Based on Meta-Analysis

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Abstract: With the rapid development of the digital economy and digital technologies, the significance of digital transformation for high-quality enterprise development has been growing. Anchored in the framework of the Resource-Based View, this study employs a meta-analytic approach to systematically, quantitatively analyze 40 empirical studies published between 2010 and 2022. The aims are to synthesize and identify the impact mechanisms of digital transformation on high-quality enterprise development, while also further examining the moderating effects of heterogeneity. The findings reveal that digital transformation exerts a significantly positive influence on high-quality enterprise development through three mechanisms: factors related to innovation, factors linked to enterprise performance, and factors associated with capital market performance. Notably, irrespective of the degree of heterogeneity, both the primary effects of digital transformation on high-quality enterprise development and the moderating effects of various impact mechanisms are statistically significant. The results underscore the importance of digital transformation in driving high-quality enterprise development and offer valuable insights for relevant decision makers.

Keywords: digital transformation; enterprise; meta-analysis; high-quality; moderating effect



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1. Introduction

With the pervasive integration of digital technology and the widespread popularity of the internet, the digital economy has rapidly evolved into a predominant driver of global economic advancement. This paradigm shift not only heralds an era of unprecedented opportunities for enterprise innovation and high-quality growth but also ushers in a transformative phase for traditional industries [1]. As businesses navigate the dynamic landscape shaped by the digital economy, they confront an intricate interplay of challenges and opportunities brought about by digital transformation. This transformative wave engenders novel business models and operational methodologies, catalyzing a reduction in production and transaction costs, a broadening of market horizons, and a discernible enhancement of overall economic efficiency. Nonetheless, it is imperative to acknowledge that the journey of digital transformation is accompanied by its own set of inherent risks, including digital technology barriers, platform monopolistic competition, and data compartmentalization [2]. These risks, if not proactively managed, have the potential to dampen enterprises' proclivity toward embracing the ethos of digitalization. In this context, the pursuit of in-depth research that meticulously investigates the profound impact of digital transformation on the high-quality development of enterprises assumes critical theoretical and pragmatic significance.

What can digital transformation bring to enterprises? It has been pointed out that digital transformation enhances value creation for businesses, ignites entrepreneurial spirit, and brings about digital dividends [3]. The work of Wruck indicates that the digital transformation of businesses in the sharing economy can organically integrate value propositions with business model characteristics, thus promoting better corporate social responsibility

practices and sustainable development [4]. In the study by Song, it was highlighted that the network effects and business model innovations resulting from digital transformation can reduce transaction costs for enterprises, expand marketing channels, and disrupt traditional business models [5]. Additionally, Li pointed out that digital transformation can effectively enhance technological innovation capabilities, reduce business risks, and significantly elevate enterprise value levels [6].

It is essential to soberly recognize that digital transformation for enterprises carries inherent risks. Digital transformation is a complex, long-term, and costly endeavor [7]. It encompasses various aspects, from software and hardware procurement to ongoing system maintenance, from equipment upgrades to personnel training. Research suggests that a significant obstacle to enterprise digital transformation is the lack of sufficient awareness and understanding among both management and employees [8]. Managers often perceive digital transformation as highly risky, potentially threatening their authority. On the other hand, employees may fear being replaced by artificial intelligence and robots once digital transformation is complete [9]. The limited and vague comprehension of digital transformation by both management and employees, coupled with uncertainty regarding the post-transformation state, makes the process of enterprise digital transformation a challenging endeavor. Furthermore, enterprises undergoing digital transformation may also encounter risks related to data security and privacy protection [10]. The application of digital technologies often involves extensive data collection and processing. Failure to adequately safeguard data security and privacy may result in potential risks and liabilities.

To better ensure the successful implementation of digital transformation, it is imperative to elucidate the mechanisms through which digital transformation impacts the high-quality development of enterprises. Existing scholarship uniformly espouses the belief that digital transformation constitutes a pivotal driver of high-quality development [11,12]. Central to this belief is the conviction that digital transformation exercises a favorable influence across three pivotal dimensions: innovation capability, competitive potency, and the sphere of enterprise management and operations. Proponents of this viewpoint posit that the ubiquitous integration of digital technology is poised to amplify the efficacy and caliber of innovation endeavors [13]. In tandem, digital transformation bestows a repertoire of novel market opportunities and innovative business paradigms upon enterprises [14]. Regarding the impact of digital transformation on enterprise management and operations, research in this area explores how digital transformation influences the internal operational management systems of enterprises, including production, supply chains, human resources, and other aspects [15]. The application of digital economy technologies, such as big data analytics, the Internet of Things, and artificial intelligence, can optimize enterprise production processes, improve operational efficiency, reduce costs, and enhance resource allocation, thus propelling high-quality development in enterprises [16]. By harnessing the power of digital economy technologies, such as big data analytics, the Internet of Things, and artificial intelligence, enterprises stand poised to optimize production paradigms, amplify operational efficiency, curtail expenditures, and refine resource allocation mechanisms [17].

The Resource-Based View (RBV) emphasizes that enterprises can build sustained competitive advantages and achieve sustainable development by developing, acquiring, and managing resources that are valuable, rare, inimitable, and non-substitutable [18]. The RBV provides a theoretical framework for analyzing the impact of digital transformation on the high-quality development of enterprises. Digital transformation can promote continuous innovation within enterprises by developing new resources and capabilities, responding to market changes and customer demands, and supporting long-term development [19]. Through digital transformation, enterprises can upgrade traditional products and services, enhancing the value and scarcity of their resources and making them more difficult for competitors to imitate or substitute [20]. Enterprises can build complex technological architectures and unique corporate cultures through digital transformation, which are difficult for competitors to replicate quickly. Digital transformation offers more efficient tools and

methods for resource management, aiding enterprises in better allocation and utilization of their resources through technologies such as ERP systems and cloud services [21].

In summation, it is apparent that existing research endeavors probing the impact of digital transformation on enterprise high-quality development have yielded substantial insights. Nonetheless, the extant body of scholarship is not devoid of certain limitations. Primarily, a predominant share of existing research gravitates toward dissecting individual impact mechanisms that elucidate how digital transformation interplays with enterprise high-quality development. Yet, a discernible gap prevails in quantifying the magnitude of these impact mechanisms with precision. Additionally, the limitations associated with single empirical studies reverberate, constraining the capacity to generalize findings across diverse contexts characterized by varying geographical regions, policies, and industries. To circumvent these limitations, a concerted effort is warranted to comprehensively elucidate the intricate interplay between multifarious factors. This endeavor mandates a diversified toolkit encompassing a spectrum of research methodologies and data sources. Moreover, the existing repertoire of research methodologies employed to evaluate digital transformation invariably hinges on textual analysis, wherein the frequency of digital-related terminologies within company annual reports serves as a barometer to gauge the state of digital transformation. Yet, this method is not without its pitfalls and can potentially engender research errors of considerable magnitude.

This article employs a meta-analysis approach to comprehensively elucidate the mechanism through which digital transformation impacts the high-quality development of enterprises. Meta-analysis involves the synthesis and comparison of results from multiple independent empirical studies, focusing on a specific research topic [22]. Meta-analysis has allowed us to systematically aggregate findings from a wide array of empirical studies, providing a comprehensive overview of the current state of research. This approach is particularly valuable in fields like digital transformation, where studies are diverse in terms of methodologies, sectors, and geographical focus. Meta-analysis offers a broad perspective on the varied impacts of digital transformation across different contexts. In addition, meta-analytic methods allow us to quantitatively assess the overall impact of digital transformation on the high-quality development of enterprises. This quantitative synthesis enhances the rigor and objectivity of our conclusions and provides a solid statistical basis for identifying significant trends and impacts that individual qualitative studies may not reveal. Through meta-analysis, this article aims to explore the following three questions: How can we construct a theoretical analytical framework based on economic theories to investigate the impact of digital transformation on enterprise high-quality development? What are the mechanisms through which digital transformation influences enterprise high-quality development? And, how strong are these mechanisms?

The innovations of this study are as follows: (1) Building upon the Resource-Based View (RBV), our research crafts a nuanced analytical framework that meticulously categorizes the impact mechanisms of digital transformation into three distinct dimensions: innovation, performance, and capital market effects. This framework facilitates a deeper understanding of digital transformation's multifaceted impacts, setting a foundation for future theoretical and empirical inquiries. (2) It leverages a meta-analytic approach to synthesize findings from a broad spectrum of empirical studies published between 2010 and 2022. This comprehensive aggregation not only illuminates the overall impact of digital transformation on enterprise development but also disentangles the complex interplay of innovation, performance, and capital market dynamics underlying this relationship. (3) Beyond theoretical contributions, our study offers actionable insights for practitioners and policymakers. By delineating the pathways through which digital transformation fosters high-quality development, we provide a valuable reference for strategic decision making and policy formulation, aimed at leveraging digital technologies for competitive advantage.

2. Theoretical Basis and Research Hypotheses

2.1. Theoretical Basis

The Resource-Based View (RBV) was initially introduced by Wernerfelt in 1984 and constitutes a fundamental economic framework for explicating both a firm's competitive advantage and its economic performance [23]. At the heart of RBV lies the identification of core resources, asserting that a firm's competitive advantage and superior performance derive from its unique internal resources and capabilities. Barney (2001) categorizes these resources as encompassing all of a firm's assets, capabilities, organizational processes, attributes, information, and knowledge, which must be valuable, scarce, hard to copy, and non-substitutable [24]. Grant (1991) further refines this idea by distinguishing between tangible resources like assets, equipment, and technology, and intangible resources such as a company's reputation and culture, suggesting that these intangible assets are often pivotal to a competitive edge [25].

Firms can secure a competitive advantage through effective analysis of resources and the environment, coupled with judicious strategic choices. Peteraf (1993) emphasizes the importance of resource heterogeneity and immobility as foundations for such an advantage, considering the assessment of the external market and industry configurations as crucial for attaining an edge [26]. Additionally, Eisenhardt and Martin (2000) observe that strategic decisions rooted in core resources can translate into key strategic initiatives like product innovation, market positioning, and acquisitions, leading to competitive advantages [27]. Lastly, by effectively utilizing and integrating core resources to foster competitive advantages, firms can markedly improve their performance. The theoretical framework of the Resource-Based View is illustrated in Figure 1.

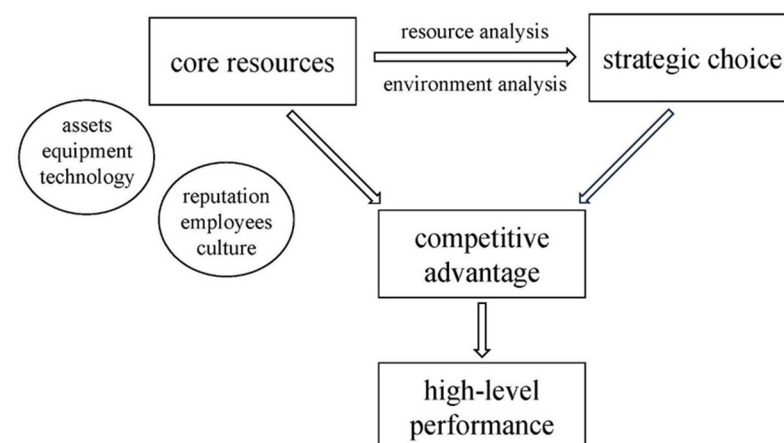


Figure 1. Theory framework of Resource-Based View.

Within the framework of the Resource-Based View (RBV), digital transformation is poised to enhance competitive advantage through three core resource perspectives: elevating enterprise innovation, improving enterprise performance, and bolstering capital market presence. By embracing digitalization, enterprises can infuse their innovation pipeline with cutting-edge technologies and data-driven insights, leading to the development of novel products and services that are difficult to replicate. Enhanced performance can manifest through streamlined operations, cost reductions, and more personalized customer experiences, directly influencing bottom-line growth. Furthermore, a robust digital strategy can significantly improve a firm's valuation and attractiveness to investors in the capital markets by demonstrating a commitment to long-term growth and adaptability in a technology-centric business landscape. The analytical framework for the impact of digital transformation on the high-quality development of enterprises is depicted in Figure 2.

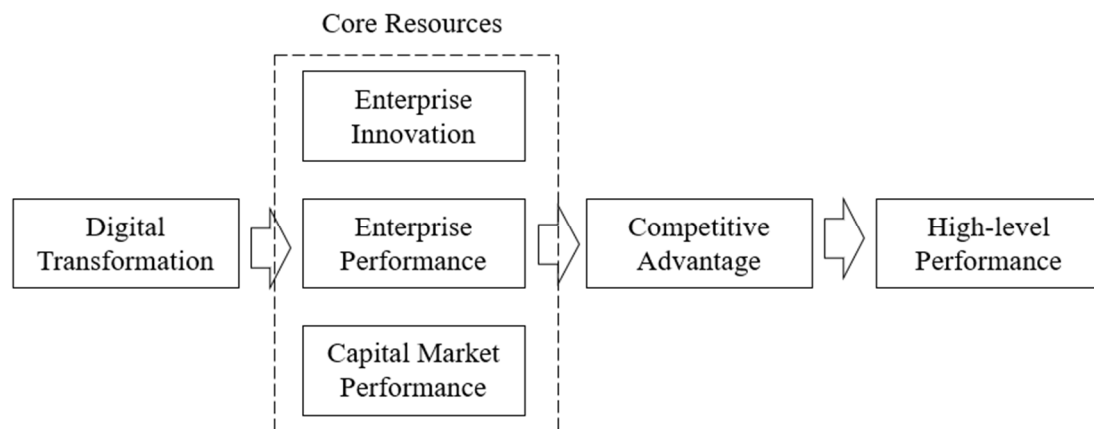


Figure 2. The impact of digital transformation on high-quality development of enterprises.

2.2. Research Hypotheses

2.2.1. Digital Transformation Facilitates Enterprise Innovation

In the realm of contemporary business dynamics, the propulsion of enterprise innovation has emerged as a pivotal outcome of digital transformation. Primarily, the advent of digital transformation ushers in an era of expanded horizons for enterprise innovation [28]. The reason for innovation failures is due to not only the customers' resistance towards innovation, subsequent changes, and ignored factors that promote customer acceptance, but also the other disregarded factors that motivates the resistance towards innovation adaptation [29]. Through the adept utilization of digital technologies, corporations can gain access to an extensive reservoir of data and informational resources, affording them a nuanced and granular understanding of the market, customer behaviors, and competitive landscapes. This enhanced vantage point empowers companies to discern market demands and vicissitudes with heightened acuity, thereby unfurling novel avenues for innovative pursuits. For instance, harnessing the potency of big data analytics, enterprises unravel intricate consumer predilections, thereby orchestrating the development of products and services that resonate harmoniously with the pulse of market exigencies. Moreover, the paradigm of digital transformation kindles a spirit of synergy and information-sharing with collaborators, orchestrating a symphony of technology exchange and integration that reverberates through the corridors of innovation [30].

Secondly, the surge of digital transformation orchestrates a symphony of heightened efficiency within the realm of enterprise innovation. The infusion of digital technology into the innovation landscape bestows upon companies an accelerated cadence for research and inventive endeavors. By leveraging technological marvels such as cloud computing and virtualization, enterprises are poised to harvest a bounty of cost and time savings within their research and development endeavors, consequently catalyzing the tempo of product development cycles [31]. Furthermore, digital transformation unfurls the tapestry of automation and optimization, casting a halo of augmented operational efficiency. As the gears of business processes turn more cogently, enterprises are endowed with the leeway to reallocate resources and temporal assets to fuel innovation endeavors [32].

Lastly, digital transformation engineers a paradigm shift in the tapestry and manifestation of enterprise innovation. Departing from the traditional trappings of linear and insular innovation trajectories, the digital era beckons forth a panorama of diversified innovation paradigms. The interplay of digital technology lends an aura of collaboration and co-creation to the innovation saga, as enterprises become adept at leveraging open innovation platforms to glean wisdom from external sources. This reciprocal osmosis kindles an ecosystem of open innovation collaborations, birthing innovation in multifarious forms. Moreover, the digital tide spurs the metamorphosis of innovation into an epoch of digitization and intelligence. Enterprises, fortified with digital prowess, embark upon the creation of intelligent products and services, harnessing the formidable potential of artificial

intelligence and the Internet of Things [33]. This digital alchemy engenders innovation at elevated echelons of sophistication. The trailblazing force of digital transformation also unfurls avant-garde models of innovation, exemplified by the sharing economy and platform economy. As enterprises navigate these uncharted waters, they are propelled towards novel vistas of innovation, ushering forth an epoch fraught with opportunities and challenges that hold the potential to galvanize high-quality development.

Based on the above analysis, this study proposes the following hypothesis:

H1: *Digital transformation drives high-quality development by influencing enterprise innovation.*

2.2.2. Digital Transformation Enhances Enterprise Performance

Digital transformation plays a pivotal role in bolstering enterprise performance, thereby setting the stage for robust high-quality development. This transformative journey unfolds on multiple fronts, each contributing to the overall advancement of businesses in this digital age.

To begin with, digital transformation serves as a catalyst for elevating operational efficiency within enterprises, consequently amplifying their performance metrics. The strategic integration of digital technologies into various business processes empowers companies to achieve unparalleled levels of automation and optimization, effectively curtailing laborious manual tasks and redundant operations [34]. The marriage of digital innovation with traditional practices is exemplified through the utilization of cutting-edge solutions such as the Internet of Things and expansive data analytics. These technologies empower enterprises to remotely monitor equipment and predict maintenance requirements, thereby inducing a substantial reduction in both production and operational costs [35]. In addition, the phenomenon of digital transformation bequeaths a newfound ability to seamlessly orchestrate supply chain logistics, paving the way for heightened efficiency in logistics operations while simultaneously mitigating the burdensome costs associated with inventory maintenance and transportation [36]. The confluence of these operational enhancements leads to a judicious allocation and utilization of resources, culminating in the enhancement of overall enterprise performance.

Moving forward, digital transformation orchestrates a paradigm shift in labor dynamics, facilitating the ascendancy of employee digital literacy, and consequently underpinning the augmentation of enterprise performance [37]. As the digital landscape advances, enterprises set forth ever-increasing demands for a diversified skill set and knowledge base from their workforce. Employees are mandated to embrace proficiencies encompassing the application of digital technologies, adeptness in data analysis, a propensity for innovative thinking, and an inherent agility to adapt to rapid changes [38]. Through targeted training and deliberate learning initiatives, companies are well-positioned to cultivate an adept workforce capable of navigating the intricacies of novel technologies and the evolving demands precipitated by digital transformation. Moreover, digital transformation catalyzes a reconfiguration of labor dynamics, wherein the integration of automation and intelligent technologies may precipitate a reduction in the number of traditional job roles, while concurrently fostering an augmented demand for adeptness in digital technology and data analysis.

Conclusively, digital transformation acts as a catalyst for business innovation and engenders a transformative ripple effect, ultimately birthing novel avenues for growth. Through the prism of digital transformation, enterprises embark on the exploration of uncharted terrains, traversing new business models and unearthing hitherto unseen market opportunities. A quintessential example is the realm of traditional retail, which has undergone a metamorphosis through the establishment of online sales platforms [39]. In embracing digital transformation, these retail giants have artfully interwoven online and offline sales, encapsulating a dynamic new business model. Simultaneously, the panorama of digital transformation unfurls novel industries and ecosystems, presenting enterprises with a trove of nascent growth prospects [14]. This proactive embrace of business innovation and

transformation enables companies to continually augment their competitive edge, expand their market footprint, and fortify the bedrock for a trajectory of high-quality development.

Grounded in the comprehensive analysis above, this study propounds the ensuing hypothesis:

H2: *Digital transformation drives high-quality development by enhancing enterprise performance.*

2.2.3. Digital Transformation Improves Capital Market Performance

Primarily, digital transformation has proven instrumental in alleviating the financing constraints that businesses often encounter. Traditional enterprises have frequently faced issues like information asymmetry and inadequate collateral when seeking financing, resulting in higher financing costs or an inability to secure sufficient financial support [40]. However, the advent of digital transformation has allowed companies to present a more comprehensive and accurate portrayal of their operational situation and potential, thereby reducing financing risks and increasing the probability of successful financing endeavors [41]. By leveraging digital technologies, companies can establish more precise risk assessment models and credit rating systems, which bolster financial institutions' confidence in them. Consequently, this diminishes the hurdles of obtaining financing and lowers the associated costs. Furthermore, digital transformation expands the spectrum of financing channels available to enterprises. Innovative financing avenues like crowdfunding and internet-based financial services offer a broader range of funding options, catering to diverse financing needs and thereby fostering enhanced overall performance.

Subsequently, digital transformation exerts substantial influence over strategic decision making within enterprises. The digital age has ushered in novel growth prospects and challenges, demanding a fresh approach to strategic considerations. Enterprises now prioritize innovation, agility, and adaptability to effectively navigate the ever-changing market and competitive landscape [42]. With improved capabilities to gather market intelligence and consumer feedback through digital transformation, enterprises are better positioned to discern emerging market opportunities and industry trends. As a result, they can adjust and optimize their strategies accordingly. For example, many conventional retail businesses have embraced digital transformation by venturing into e-commerce, orchestrating a seamless integration between online and brick-and-mortar operations to accommodate shifting consumer shopping preferences. Apt strategic choices and agile adjustments not only enhance market competitiveness but also contribute to achieving strategic objectives, thus profoundly impacting the enterprise's journey toward high-quality development.

In conclusion, the impact of digital transformation on an enterprise's capital market performance is a multifaceted phenomenon. Its effects extend beyond operational efficiency, resonating through strategic positioning and financing dynamics [43]. By addressing financing constraints and refining strategic decision making, digital transformation becomes a catalyst for improved capital market performance, thereby furthering the enterprise's trajectory towards high-quality development. These intricacies of the relationship between digital transformation and capital market performance are underpinned by information dissemination, strategic calibration, and financial avenues. In light of this comprehensive analysis, we put forward the following hypothesis:

H3: *Digital transformation drives high-quality development by improving enterprise capital market performance.*

3. Materials and Methods

3.1. Literature Retrieval and Selection

The surge in research on the digital economy began in 2010, coinciding with the rapid development of digital technologies. Hence, this study has limited the literature retrieval period from 2010 to 2022. Firstly, a search was conducted for Chinese journal literature. Considering the quality of the included sample literature and to reduce publication bias,

this study has limited the journal literature type to CSSCI-indexed journals and their expanded editions. The CNKI full-text database and Wanfang database were the primary search databases. The search was conducted using keywords such as “digital transformation”, “digital technology”, “industrial digitalization”, and “digital industrialization”. This initial search yielded a total of 5466 Chinese articles. For English journal articles, the primary databases searched were Web of Science, ScienceDirect, and JSTOR, using keywords such as “Digital Transformation”, “Digitalization”, and “Digital technology”. This yielded 16,215 English articles. Subsequently, a thematic selection was conducted to identify the literature that is relevant to the impact of digital transformation on the high-quality development of enterprises, resulting in a total of 6712 Chinese and English articles.

Next, following the requirements of meta-analysis techniques, further screening was carried out based on the following criteria: (1) Studies must be empirical research, excluding review articles and purely theoretical analyses. At this step, 1823 papers were excluded. (2) The literature must contain the main variables of this study, i.e., digital transformation and its various dimensions, as well as variables related to high-quality development of enterprises. At this step, 2194 papers were excluded. (3) The literature must provide sufficient data, including means, standard deviations, sample sizes, mean differences, etc., to calculate effect sizes relevant to this study. The specific calculation method followed Hunter and Schmidt’s research [44]. At this step, 2457 papers were excluded. (4) Duplicate literature was excluded, and in cases where the same paper was published in different journals or forms, only one version was selected. For studies with similar datasets, the most detailed and comprehensive literature was chosen. At this step, 190 papers were excluded. Following the literature retrieval and screening process, a total of 40 articles were included as samples for the meta-analysis, comprising 11 English articles and 29 Chinese articles. The entire screening process is shown in Figure 3.

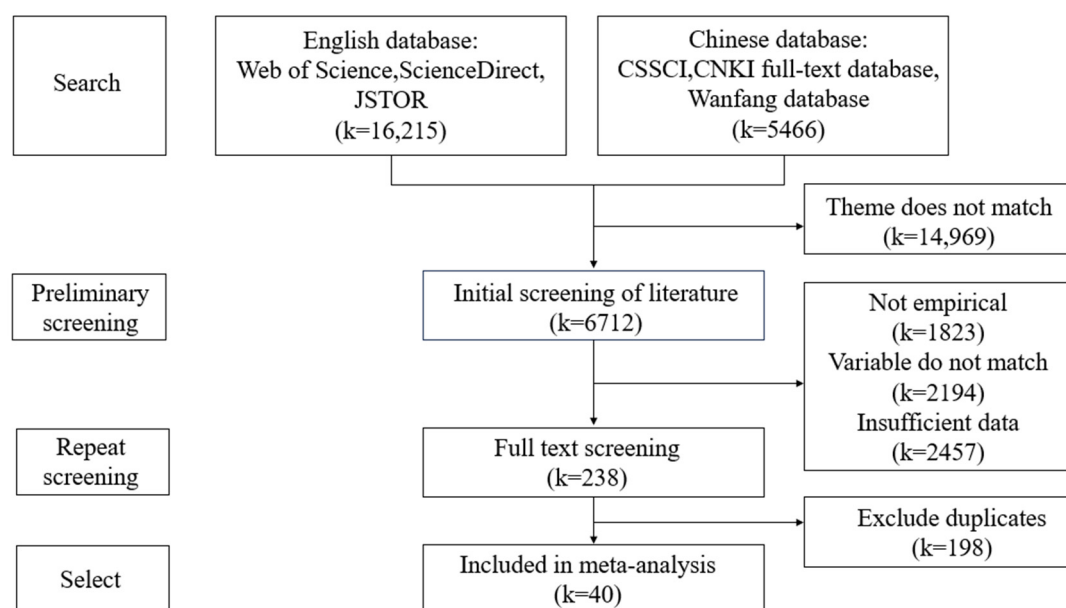


Figure 3. Literature search and screening process.

3.2. Document Code

After the literature retrieval and selection process, to facilitate later analysis and statistics, this study encoded various characteristics of the original articles included in the calculations. The characteristics recorded included the authors, publication year, sample size, correlation coefficients, and research focus.

The document coding process was independently conducted by two researchers and consisted of three steps. Firstly, the two researchers exchanged ideas to establish coding standards and consensus, and then carried out the initial round of coding, with the propor-

tion of agreement in the first round reaching 82.5%. Secondly, the two researchers carefully reviewed and discussed the differing coding results, ultimately reaching consensus, with the proportion of agreement in the second round increasing to 95.0%. Finally, for the remaining parts with differing codes, the two researchers conducted further reviews and discussions, and ultimately integrated these into consistent coding.

4. Results

4.1. Publication Bias Test

In this study, calculations were performed by using the Comprehensive Meta-Analysis 2.0 (CMA 2.0) software. The meta-analysis method uses the research effect values of the relevant literature related to the research topic as the research samples, so it is necessary to collect as comprehensive literature as possible. Publication bias refers to the bias in meta-analysis results caused by researchers' inability to retrieve all the data in the relevant field, leading to data omissions. For this study, there might be missing data due to the unavailability of unpublished articles. Additionally, among the published literature, there are more studies confirming the research hypotheses, and most journals tend to publish articles with significant results, which could result in publication bias.

Therefore, this study first conducted the Egger linear regression test, and the results are shown in Table 1.

Table 1. Results of the publication bias test.

Intercept	Sde.	95%CI L.L.	95%CI U.L.	t	Df	p
1.679	9.028	−16.60	19.96	0.186	38	0.854

From Table 1, it can be observed that the intercept of the publication bias test result is 1.679, which is close to 0, and the *p*-value is 0.854, which is greater than 0.05. This indicates that the possibility of bias is minimal, and there is no significant publication bias.

4.2. Main Effects Analysis

According to the statistical principles of meta-analysis, only data with good homogeneity can be combined. Therefore, it is necessary to conduct heterogeneity tests on the results of multiple studies in order to select the appropriate effect model based on the heterogeneity analysis results. When the heterogeneity among studies is large, a random-effects model is used for analysis; when the heterogeneity is small, a fixed-effects model is used for analysis. In this study, the Q test and I^2 test were used to examine the research samples, and the results are shown in Table 2.

Table 2. Main effect analysis results.

Model	N	Effect Estimates	95%CI		Progression		Heterogeneity Test			
			LL	UL	Z	p	Q	df	p	I^2
Fixed	40	0.400	0.398	0.403	286.797	0.000	29,981	39	0.000	99.870
Random	40	0.422	0.353	0.487	10.816	0.000				

The heterogeneity results show that the Q test results for the effect values among studies are significant ($p = 0.000 < 0.001$), indicating that the effect values in the meta-analysis are heterogeneous. The I^2 value is 99.870%, according to Higgins et al.'s criteria for heterogeneity [45], where $I^2 > 75\%$ indicates high heterogeneity among effect sizes, suggesting the use of a random-effects model for analysis. From the random-effects model, the overall effect size estimate of digital transformation on high-quality development of enterprises is 0.422, which is statistically significant ($p < 0.001$). This indicates that digital

transformation has a positive and significant impact on the high-quality development of enterprises. According to the effect size magnitude criteria proposed by Cohen [46], when the effect size is greater than 0.2 and less than 0.8, digital transformation will have a moderately positive impact on the high-quality development of enterprises.

4.3. Moderator Effect Analysis

Based on the heterogeneity test results in Table 2, $Q = 29,981$ and $I^2 = 99.870$. When Q and I^2 values are large, it indicates that the observed variance of effect sizes is not solely due to sampling error but may also be influenced by other moderating variables. In such cases, a moderation analysis should be conducted.

4.3.1. Enterprise Innovation Factors

As shown in Table 3, with enterprise innovation factors as moderating variables, the measurement dimensions include global innovation networks, knowledge spillover, innovation input, innovation capability, business model innovation, innovation absorption capability, R&D exploration capability, exploratory business model, invention patents, patent applications, R&D team, and R&D investment intensity. The results indicate that the 95% confidence intervals of the correlations for each dimension do not completely overlap and that $p < 0.001$. This suggests that in the mechanism of how digital transformation affects high-quality development of enterprises, there exists a moderating effect of enterprise innovation factors. In other words, digital transformation significantly promotes high-quality development in enterprises through its impact on enterprise innovation.

Table 3. Moderating effect of enterprise innovation factors.

Model	Mod	M.D.	Study	Effect Size				
				Correlation	L.L.	U.L.	Z	p
Fixed	EI	Global Innovation	X.S. Li (2022)	0.305	0.291	0.318	42.586	0.000
		Knowledge Spillover	X.Y. Yu (2022)	0.528	0.514	0.542	58.927	0.000
		Innovation Input	T.S. Xiao (2022)	0.127	0.112	0.142	16.526	0.000
		Innovation Capability	J.C. Zhang (2022)	0.278	0.264	0.292	38.004	0.000
		Business Model	Y.D. Qi (2022)	0.252	0.232	0.271	24.145	0.000
		Innovation Absorption	X. Jin (2022)	0.428	0.413	0.443	49.681	0.000
		Innovation Exploration	M.M. Chi (2020)	0.227	0.094	0.352	3.300	0.001
		Pattern Innovation	Bouwman (2018)	0.700	0.641	0.751	15.874	0.000
		Invention Patent	Hanelt (2020)	0.380	0.284	0.468	7.256	0.000
		Patent Application	Zhang (2022)	0.291	0.280	0.302	48.333	0.000
		R&D team	Bouwman (2019)	0.330	0.230	0.423	6.199	0.000
		R&D Investment	Lin (2020)	0.463	0.435	0.490	28.032	0.000
				0.327	0.322	0.332	121.143	0.000
Random				0.369	0.295	0.438	9.197	0.000

Digital transformation provides new opportunities and platforms for enterprise innovation. Through the global innovation network, knowledge spillover, and other factors, enterprises can access innovative resources and knowledge more widely, thereby enhancing

their innovation capability. Additionally, digital transformation strengthens interactions between enterprises, markets, and customers, facilitating the discovery and grasping of market opportunities, thereby driving business model innovation. Furthermore, digital transformation encourages enterprises to increase investment in R&D and technology, leading to an increase in invention patents and patent applications, as well as higher R&D team capacity and investment intensity, thereby enhancing innovation absorption capability and the ability to explore new business models. Overall, enterprise innovation factors play a moderating role in the relationship between digital transformation and high-quality development, promoting the innovation and development of enterprises, and providing strong support for the high-quality development of enterprises, thus confirming hypothesis H1 proposed in this study.

4.3.2. Enterprise Performance Factors

As shown in Table 4, with enterprise performance factors as moderating variables, the measurement dimensions include labor income share, optimized human capital, human resource structure upgrade, operational efficiency, capacity utilization rate, management optimization, employee skills, internal control quality, investment efficiency, corporate exports, business scope, cost reduction, labor division, capital agility, production cost control, and business model transformation. The results indicate that the 95% confidence intervals of the correlations for each dimension do not completely overlap and that $p < 0.001$. This suggests that in the mechanism of how digital transformation affects high-quality development of enterprises, there exists a significant moderating effect of enterprise performance factors. In other words, digital transformation significantly promotes high-quality development of enterprises through its impact on enterprise performance.

Table 4. Moderating effect of enterprise performance factors.

Model	Mod	M.D.	Study	Effect Size				
				Correlation	L.L.	U.L.	Z	p
Fixed	EP	Labour Income	Y.M. Fang (2022)	0.725	0.719	0.731	146.210	0.000
		Human Capital	H.D. Tang (2022)	0.829	0.811	0.846	41.743	0.000
		Workforce Composition	Y.W. Ye (2022)	0.213	0.200	0.227	30.024	0.000
		Operational Efficiency	M.Y. Huang (2022)	0.588	0.532	0.639	16.205	0.000
		Capacity Utilization	G.G. Han (2022)	0.780	0.774	0.786	133.538	0.000
		Management Optimization	Q.H. Song (2022)	0.572	0.561	0.583	80.852	0.000
		Employee Quality	H. Chen (2022)	0.286	0.274	0.298	42.723	0.000
		Internal Control	Q.C. Zhang (2022)	0.141	0.126	0.156	18.347	0.000
		Investment Efficiency	L. Li (2022)	0.177	0.156	0.198	16.131	0.000
		Export Scale	X.L. Zhong (2022)	0.637	0.630	0.644	118.334	0.000
		Business Scope	Y.R. Pan (2022)	0.545	0.469	0.613	11.757	0.000
		Cost Reduction	X. Meng (2022)	0.241	0.212	0.269	15.865	0.000
		Labor Division	Acemoglu (2019)	0.140	0.116	0.378	1.073	0.001
		Capital Agility	Mikalef (2017)	0.544	0.505	0.581	21.962	0.000
		Cost Control	Duman (2021)	0.489	0.300	0.641	4.622	0.000
		Model Transformation	Lobejko (2021)	0.668	0.647	0.688	42.380	0.000
				0.510	0.506	0.514	225.816	0.000
Random				0.512	0.376	0.627	6.524	0.000

Digital transformation provides new operational models and management methods for enterprises. From the perspectives of labor income share, optimized human capital, and human resource structure upgrade, digital transformation improves enterprise human resource management, enhances employee skills and capabilities, optimizes the alloca-

tion and structure of human resources, and thereby increases operational efficiency and the capacity utilization rate. Digital transformation also promotes the quality of internal controls and management optimization within enterprises. Through more precise data analysis and information sharing, enterprises enhance internal process monitoring and management, thereby improving investment efficiency and cost control levels. Moreover, digital transformation encourages enterprises to undergo business model transformations and expand their business scope, making enterprises more competitive, increasing corporate exports and market share, reducing production costs, and enhancing operational effectiveness. In summary, enterprise performance factors play a crucial moderating role in the relationship between digital transformation and high-quality development. Digital transformation significantly promotes the high-quality development of enterprises through its impact on enterprise performance, validating hypothesis H2 proposed in this study.

4.3.3. Capital Market Performance

As shown in Table 5, with capital market performance factors as moderating variables, the measurement dimensions include financing constraints, capital structure adjustments, stock liquidity, managerial decision-making ability, debt default risk, competitive strategic choices, corporate social responsibility, audit quality, risk resistance capability, performance forecast quality, corporate operational performance, and digital financial products. The results indicate that the 95% confidence intervals of the correlations for each dimension do not completely overlap and that $p < 0.001$. This suggests that in the mechanism of how digital transformation affects high-quality development of enterprises, there exists a significant moderating effect of capital market performance factors. In other words, digital transformation significantly promotes high-quality development in enterprises through its impact on capital market performance.

Table 5. Moderating effect of capital market performance factors.

Model	Mod	M.D.	Study	Effect Size				
				Correlation	L.L.	U.L.	Z	p
Fixed	CMP	Financing Constraint	J.Y. Wang (2022)	0.662	0.651	0.673	77.592	0.000
		Capital Structure	J.F. Shen (2022)	0.522	0.513	0.531	93.887	0.000
		Stock Liquidity	F. Wu (2021)	0.443	0.431	0.455	61.838	0.000
		Business Decision	L.L. Yi (2021)	0.290	0.277	0.304	39.389	0.000
		Default Risk	S.H. Wang (2022)	0.130	0.117	0.143	19.948	0.000
		Strategy Selection	C.Q. Wu (2022)	0.400	0.389	0.411	61.886	0.000
		Social Duty	H.Y. Zhao (2022)	0.240	0.217	0.263	19.408	0.000
		Audit Quality	H.Y. Zhai (2022)	0.134	0.119	0.149	17.332	0.000
		Risk Resistance	L. Jiang (2022)	0.231	0.128	0.329	4.312	0.000
		Earnings Forecast	Y.T. Xian (2022)	0.205	0.191	0.219	27.410	0.000
		Business Performance	Nwankpa (2016)	0.410	0.275	0.529	5.579	0.000
		Digital Finance	Shen (2019)	0.317	0.192	0.432	4.814	0.000
				0.341	0.337	0.346	146.209	0.000
Random				0.343	0.239	0.439	6.139	0.000

By selecting multiple measurement dimensions, we have discovered that digital transformation has multifaceted effects on the capital market performance of enterprises. Firstly, digital transformation improves the financing constraints faced by enterprises, allowing them to obtain financing more flexibly and enhancing the flexibility of capital structure adjustments. This moderating effect enables enterprises to better meet their funding needs, strengthens their financial stability, and thus has a positive impact on the high-quality development of enterprises. Secondly, digital transformation enhances corporate information disclosure and transparency, leading to improved audit quality and performance forecast quality. This increases investors' confidence in the enterprises, thereby enhancing stock liquidity and market recognition. Such a moderating effect contributes to improving enterprises' performance in the capital market, thereby increasing their market value and investors' trust. Additionally, digital transformation drives the enhancement of enterprises' competitive strategic choices and managerial decision-making ability, strengthens their risk resistance capability, reduces debt default risk, and further improves their capital market performance. In conclusion, capital market performance factors play a significant moderating role in the impact of digital transformation on high-quality development of enterprises. Digital transformation significantly promotes the high-quality development of enterprises through its impact on capital market performance, validating hypothesis H3 proposed in this study.

4.3.4. Summary of Moderating Effects

Subgroup analyses were conducted for each moderating factor, and the results are presented in Table 6. In the summary analysis of moderating effects, all the Tau Squared values were below 0.25, indicating the favorable adjustment effects of each moderating variable on the respective measurement dimensions. In the mixed-effects analysis, all the *p*-values were less than 0.001, signifying significant modification effects of each moderating variable on the various measurement dimensions.

Table 6. Summary analysis of moderating effects.

M.D.	Q	<i>p</i>	Tau Squared	Sde.
EI	2228	0.000	0.020	0.011
EP	16,948	0.000	0.119	0.060
CMP	25,188	0.000	0.040	0.020
Total Effect	29,981	0.000	0.068	0.020

4.4. Sensitivity Analysis

Following the identification of significant heterogeneity in the effect sizes of each study, this study reports on sensitivity analyses that were conducted to assess and validate the stability and reliability of moderating effects, as well as to examine whether the research outcomes were influenced by potential biases. Through further sensitivity analyses of the heterogeneity effect sizes for each mechanism, the following outcomes were obtained.

Within the subgroup of enterprise innovation factors, exclusion of any individual sample led to effect size fluctuations between 0.334 and 0.390, which closely aligned with the original overall effect estimate of 0.369. This suggests a consistent impact of enterprise innovation factors on the relationship between digital transformation and high-quality development, indicating relatively stable moderating effects.

In the subgroup of enterprise performance factors, excluding any individual sample resulted in effect size variations ranging from 0.481 to 0.533, with minimal deviation from the original overall effect estimate of 0.512. This indicates that the moderating effect analysis of enterprise performance factors within the mechanism of digital transformation's influence on high-quality development similarly demonstrates a high level of stability.

Within the subgroup of capital market performance factors, exclusion of any individual sample led to effect size fluctuations between 0.306 and 0.361, closely aligning with the original overall effect estimate of 0.343. Regardless of the study excluded, the

impact of capital market performance factors on the relationship between digital transformation and high-quality development remained relatively consistent, signifying a stable moderating effect.

In conclusion, through sensitivity analyses, we have validated the stability of moderating effects for enterprise innovation factors, enterprise performance factors, and capital market performance factors in the context of digital transformation's influence on high-quality development. These findings enhance our understanding of the mechanisms through which digital transformation affects high-quality development in enterprises and provide reliable support for relevant policies and managerial decisions.

5. Discussion

5.1. Major Findings

This paper conducts a meta-analysis of 40 empirical studies on the mechanism through which digital transformation impacts the high-quality development of enterprises. Drawing from the Resource-Based Theory and combining insights from the relevant literature, three pathways by which digital transformation drives high-quality development are identified: fostering innovation, enhancing enterprise performance, and improving capital market performance. The specific findings are outlined as follows:

Firstly, this study employs the Resource-Based Theory to elucidate the mechanism through which digital transformation affects the high-quality development of enterprises. It posits that digital transformation involves the acquisition, integration, and application of enterprise resources—a foundation for gaining competitive advantage in the market and a crucial factor in promoting high-quality development [47]. In particular, digital transformation, through avenues like data mining, information sharing, optimization of human capital, enhanced operational management, and alleviating financing constraints, facilitates the acquisition and enhancement of three core resources: innovation, enterprise performance, and capital market performance [48,49]. This constructs a competitive advantage for enterprises and facilitates high-quality development.

Secondly, through a meta-analysis of the 40 empirical studies, this research unveils the pathways through which digital transformation impacts high-quality development. Firstly, digital transformation significantly contributes to fostering innovation within enterprises. The widespread application of digital technologies provides enterprises with increased opportunities for innovation, promoting technological, product, and service innovations that expand the scope and level of innovation activities [50]. Secondly, digital transformation plays a crucial role in elevating enterprise performance. By leveraging digital technologies, enterprises can optimize internal operations, enhance production and operational efficiency, and reduce costs, thereby achieving superior performance [51]. Thirdly, digital transformation improves an enterprise's performance within the capital market. By strengthening interaction between enterprises and the capital market, digital transformation enhances investor confidence, leading to increased stock liquidity and improved stock price performance [52]. It is noteworthy that the effectiveness of these impact mechanisms remains consistent across different degrees of heterogeneity, as the positive effects of digital transformation on high-quality development persist in various contexts. These research findings have significant implications for guiding enterprises to optimize strategic decisions, enhance innovation capabilities, and bolster market competitiveness during the process of digital transformation, thereby providing practical guidance for achieving high-quality development.

5.2. Research and Practical Contributions

This paper, from the perspective of the Resource-Based Theory, analyzes the essence of how digital transformation impacts the high-quality development of enterprises. The key to the high-quality development of enterprises lies in their ability to possess and effectively manage various resources, including physical assets, knowledge assets, and human resources. Digital transformation enables enterprises to better manage and utilize

these resources, enhancing their innovation capabilities, efficiency, productivity, market performance, and customer satisfaction, ultimately achieving high-quality development. This is crucial for enterprises to maintain competitiveness and sustainable growth in highly competitive markets.

We systematically clarify the impact mechanism of digital transformation on the high-quality development of enterprises, categorizing it into three dimensions: enterprise innovation, enterprise performance, and capital market performance. This classification effectively avoids the problem of unclear dimensions in the impact mechanism. Based on the Resource-Based View (RBV) framework, this paper comprehensively explains the impact mechanism of digital transformation on the high-quality development of enterprises and its strength, providing reliable evidence for future research on digital transformation.

To promote digital transformation and achieve high-quality development in enterprises, this paper proposes two specific recommendations. First, enterprises need to clearly define their digital transformation goals and vision, including the specific problems they aim to solve through digital transformation, the business growth objectives they wish to achieve, and the improvements in efficiency and benefits they seek. Based on these goals and visions, a concrete and executable digital strategy plan should be developed. This approach can reduce the randomness of digital transformation and lower the risk of failure. Second, building and optimizing data analysis capabilities is essential to ensuring the accuracy of data collection and the effectiveness of data analysis. Data analysis capability is the foundation of an enterprise's digital transformation. Through in-depth data analysis of customer needs, market trends, and operational efficiency, and by supporting the decision-making process in a data-driven manner, enterprises can provide a more personalized, convenient, and efficient customer experience, thereby enhancing the scientific and forward-looking nature of decision making.

It is noteworthy that the internet has become a primary tool for communication and business. In the process of digital transformation, the ability to analyze and predict consumer behavior on a large scale has become a top priority for businesses. During this process, ensuring consumer privacy is a crucial area of research. There have been studies addressing citizen privacy concerns when governments use digital technologies such as artificial intelligence. Research has identified eight main themes related to human behavior prediction, intelligent decision making, decision automation, digital surveillance, data privacy laws and regulations, as well as the risk of behavior modification; these are key areas of concern for ensuring the secure use of data by enterprises [53].

5.3. Limitations and Future Research

This study has several limitations that warrant further refinement in future research. Firstly, despite our efforts to comprehensively collect the relevant literature and its effect sizes, there may still be a small amount of omission due to the inherent limitations of meta-analysis techniques. Secondly, the quality of the data acts as the guarantee of the effectiveness and accuracy of meta-analysis conclusions. Ensuring the availability of experimental data is an indispensable step before conducting a meta-analysis. However, the verification of data authenticity needs to be strengthened. Finally, after subgroup analysis, unexplained heterogeneity still exists, suggesting the possible presence of other valuable moderating variables, such as corporate culture and organizational transformation, supply chain collaboration, and so on. Future research could delve deeper into the following aspects:

Specific processes and manifestations of the impact of digital transformation on high-quality development of enterprises: Digital transformation can reduce costs and promote corporate innovation, while also giving rise to novel value creation models such as industrial internet platform models and two-sided market models, aiding enterprises in achieving high-quality development. The specific processes and driving factors of this impact warrant further investigation.

The relationship between digital transformation and high-quality development can extend from the enterprise level to the industry level: How enterprises make sound digital decisions and promote digital transformation also requires precise identification and analysis of the industry ecosystem in which they operate.

Policy and management strategies for digital transformation: The policy and management strategies for digital transformation have a significant impact on the process and outcomes of enterprise digital transformation. Rational policy guidance and effective internal management strategies can drive enterprises to achieve digital transformation goals, enhance competitiveness, and foster innovation capabilities. Exploring the policies and management strategies related to digital transformation could accelerate the pace of transformation, elevate core competitiveness, and facilitate high-quality development.

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