

The Impact of Digital Transformation on the Market Value of Sports Enterprises: An Empirical Study based on A-share Listed Sports Companies

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Abstract

As the digital economy keeps evolving, the way we value sports enterprises is changing fast-and it's shaping where the industry heads next. In this paper, I dig into how digital transformation lifts the market value of these companies and figure out what's really fueling that growth. First, I use Python to scrape annual reports and pull out the data that matters. Then I put those numbers to work with a two-way fixed-effects model, testing the core ideas directly. The results stand out: digital transformation isn't just a buzzword-it's a big reason why sports enterprises see their market value climb, and this effect remains strong even after rigorous checks. Mediation tests further indicate that digital transformation boosts market value through three mechanisms: relaxing financing constraints, elevating total factor productivity, and stimulating innovation expenditure. To capture the interplay among different digital technologies, we additionally employ fuzzy-set qualitative comparative analysis (fsQCA). From a configurational standpoint, several distinct paths leading to high market value are uncovered – such as the "big-data-and-cloud-computing-led" path – confirming the "multiple conjunctural causation" nature of digital transformation outcomes. Theoretically, this research enriches studies on digital transformation in specialized industrial contexts. Methodologically, it combines econometric regression with configurational analysis and thereby provides a new analytical perspective. Practically, the findings offer concrete guidance for sports enterprises in formulating differentiated digital transformation strategies and optimizing resource allocation, while also providing empirical support for relevant policymaking.

Keywords

Digitalization; Sports Enterprises; Market Value; fsQCA.

1. Introduction

As the digital economy has become a strategic national priority, the digitalization of the sports industry has emerged as a crucial pathway for achieving its high-quality growth [1]. Although digital technologies have been shown to empower enterprise value creation by enhancing efficiency and enabling business model innovation, there remains a scarcity of industry-specific empirical evidence on whether digital transformation genuinely elevates the market value of sports firms – especially given their relatively late start, generally modest scale, and uneven progress in transformation[2-4].

Against this background, this study concentrates on A-share listed sports companies and empirically explores the impact of digital transformation on their market value. This topic is not only closely aligned with contemporary policy priorities but also addresses a critical practical issue for the high-quality development of the sports industry.

First, through baseline regressions and robustness checks, we confirm that digital transformation exerts a significant positive effect on the market value of listed sports firms, thereby laying a necessary foundation for subsequent analysis.

Second, considering that sports enterprises differ substantially in terms of development foundation and organizational attributes, the effects of digital transformation may display strong heterogeneity[5,6]. Therefore, the sample is divided by firm size (larger versus smaller asset scale) and ownership type (state-owned versus non-state-owned) to examine heterogeneous effects. In addition, mediation tests are conducted to open the “black box” linking digital transformation and market value by examining whether financing constraints, total factor productivity, and innovation input serve as mediating mechanisms.

Not all digital technologies play by the same rules. Some cost more to build, others have a head start, and a few just fit better in one setting than another. On top of that, each industry has its quirks. What works in one field can fall flat in another—that’s why companies have to blend digital tools in their own way. For this study, I turned to fsQCA to pinpoint how different digital transformation strategies impact market value. It’s not just about what tools you pick, but how you mix them. I tracked the main routes to strong market performance, and matched those with examples from real sports companies. My aim’s straightforward: I want to give sports organizations policy advice they can actually use, so they get the most out of digital transformation—not just in theory, but on the ground.

Most research on digital transformation and market value throws all listed companies into one bucket. Rarely does anyone narrow in on a single sector. This paper does just that—it zooms in on listed sports companies. That tighter focus delivers sharper analysis and uncovers insights you just don’t get from the usual all-industry approach. Does this actually matter for sports companies? Absolutely. They get a clearer picture of how digital transformation can shape their market value. This goes beyond theory—it explains why digital strategies are worth attention and shows these companies concrete ways to stay ahead and grow profits. Investors care, too. They want to spot which sports companies are leading the digital charge so they can adjust their portfolios and take on less risk. Policymakers aren’t left out, either. These findings give them more than just spreadsheets to look at. They point to specific directions for building policies that actually move the sports industry forward—faster, and smarter.

2. Research Status and Literature Review

You can sort the literature into three big perspectives. First up: the equity market value view. In this camp, people see enterprise value as basically the same thing as the market value of a company’s equity. It’s simple math—share price times number of shares. But there’s more going on here. This isn’t just about what you can see or touch. It scoops up everything, from intellectual property to reputation and the power of talented employees. Enterprise value, measured like this, signals how the market sizes up a company’s future growth and potential. That’s why investors look at it closely when they’re thinking about mergers or takeovers. Take a step back and you’ll find another view: enterprise value as the total output a company delivers, from the very start—production—all the way to getting products in customers’ hands. Then there’s a third perspective, which shifts focus to utility satisfaction. Here, the “optimized stakeholder theory” takes the spotlight. It rests on marginal utility theory and claims that if a company’s shooting to maximize its value, it has to make sure stakeholders get at least as much return as they contributed. At the end of it all, what really counts is that the people who put their resources into the business get enough back. Anything less doesn’t cut it.

Researchers dove into the numbers and found something obvious: the digital wave is shaking up the old ways of doing business. Sure, companies run into plenty of headaches along the

way-but ultimately, the upside wins. Digital transformation doesn't just move information faster; it completely rewires how companies share, connect, and react. But here's the thing. To really get ahead, firms can't just talk about change-they have to jump in, take risks, and adapt if they want more market share. Big data isn't just some buzzword. In practice, it sharpens services, streamlines how things get done, and makes products better. To actually measure all this, researchers built a digital transformation index and traced industry patterns from 2010 to 2020. With that index in hand, they can see how digital change sparks new ideas and keeps companies pushing for more innovation.

In terms of research content, most existing studies are based on full-industry samples and lack a focused analysis of the sports industry as a specialized sector, making it difficult to reveal sector-specific mechanisms. In terms of methodology, most studies rely on regression analysis to estimate the "net effects" of variables and do not examine, from a configurational perspective, how combinations of digital technological elements (such as ABCD technologies) jointly influence firm market value through mechanisms of multiple conjunctural causation[7].

This study tackles a question a lot of people overlook: how does digital transformation actually influence the market value of sports companies? To answer this, the researcher builds a model that links the level of digital transformation-measured by a well-established digital transformation index-to changes in market value. They pick a regression model that fits the data and test if going digital gives these firms a real advantage. They don't just settle for big-picture conclusions. The analysis breaks things down by ownership structure and firm size to see if these aspects change the story. For mediation analysis, the focus lands on three key elements-total factor productivity, financing constraints, and innovation capacity. These are the gears turning behind the scenes that show how digital transformation works within organizations. But the study doesn't stop there. Not all digital technologies are cut from the same cloth. They differ in how mature they are, how easily they transfer across contexts, their costs, and where they fit operationally. To capture this complexity, the research brings in Qualitative Comparative Analysis (QCA) alongside regression. This combo approach digs deeper, showing the different routes firms can take as they use digital tools to boost their value. QCA helps lay out clear pathways, with examples from the real world that make the findings concrete. Finally, the study doesn't just toss out big ideas and call it a day. It delivers specific, actionable recommendations for sports companies planning to go digital, drawing directly from the evidence. So by the end, readers don't just know what works-they know how to put it into practice.

3. Research Hypothesis

This study treats digital transformation as a bold, intentional move-not just a sprinkle of tech here and there. Companies dive in with artificial intelligence, blockchain, cloud computing, and big data, flipping the script on how their business works. It's not just about the gadgets. Real change hits every corner: business model, daily routines, the way teams are built, and how value gets made. The whole point? Strengthen core competitiveness, deep down. Digital transformation isn't some fancy word for "digitization"-that's just turning analog stuff into digital. It isn't "informatization" either, where companies lean on IT to smooth things out. This is much bigger. We're talking about a fundamental shift in how a company thinks and what it does, right at its foundations. In this study, "enterprise market value" means what the capital market thinks a listed company is worth. You usually get it by multiplying the share price by the number of shares. That figure sums up investor expectations-both on what the company is doing now and what it might pull off in the future. To get a clearer picture, we measure the market value of sports enterprises by adding their total market cap and interest-bearing debt.

That way, we catch both equity and debt-so nothing gets left out. The focus here? Chinese sports companies trading on the A-share market, as long as sports are their main business.

According to the resource-based view and dynamic capabilities theory, digital transformation turns digital technologies and data resources into strategic assets, improves operational efficiency, innovates business models, strengthens adaptability, and ultimately consolidates firms' competitive advantages and growth foundations. Information asymmetry theory further suggests that digital transformation itself sends a positive signal to the market. Therefore, this paper proposes the core hypothesis that digital transformation exerts a significant positive effect on the market value of sports enterprises.

4. Research Design

4.1. Variable Design

We started by creating a custom lexicon focused on digital transformation terms relevant to listed companies. Using Python, we scraped annual reports from every A-share company on the Shanghai and Shenzhen stock exchanges. Once we had the reports, we ran text analysis with Python to generate a digital transformation index for sports enterprises-a way to measure how digitally advanced each company is. For market value data, we turned to CSMAR and Wind databases. We also collected control variables, such as firm characteristics, financial risk, operational efficiency, and internal governance.

To enhance the reliability of the empirical findings, the sample underwent additional filtering following standard procedures in prior literature. Specifically, firms that were delisted during the observation window were removed, as were those with incomplete disclosures or missing values. Moreover, to curb the impact of extreme observations, all continuous variables were winsorized at the 1st and 99th percentiles. To account for potential heteroscedasticity, non-ratio variables were transformed using natural logarithms.

(1) Dependent variable: enterprise market value. Market value is defined as the sum of total market capitalization and interest-bearing debt. In robustness checks, an alternative measure is adopted – total market capitalization plus interest-bearing debt minus cash and cash equivalents.

(2) Core explanatory variable: digital transformation. The concept of digital transformation is disaggregated into two dimensions: "underlying technology application" and "technology practice application." The former captures foundational technologies, specifically the ABCD technologies – artificial intelligence, blockchain, cloud computing, and big data. The latter reflects the deployment of digital tools in concrete business contexts, including references to the "Internet," "mobile payments," and "Fintech." The frequency of these keywords in annual reports is tallied and aggregated to construct a proxy indicator for a firm's digital transformation level

4.2. Model Design

First, a two-way fixed effects model is constructed to empirically test the internal relationship between digital transformation and enterprise value. The benchmark regression model is shown as Equation (1). To avoid the influence of unobservable factors caused by individual differences and year effects, both firm fixed effects and time fixed effects are included.

In regression model (1), Digit is the core explanatory variable, Value is the dependent variable, Controls denotes the control-variable set, firm fixed effects and year fixed effects are included, and the stochastic disturbance term is retained.

Second, to examine heterogeneity in the effect of digital transformation on enterprise value, this paper adopts ownership type and firm size as two criteria for heterogeneous classification, and the corresponding empirical models are shown as Equations (2) and (3).

Finally, to more fully capture the mediating effect between digital transformation and enterprise market value, the mediation-testing method has been followed, and the specific models are shown as Equations (4) and (5), where the mediating variables include the SA index, total factor productivity, and innovation capability.

5. Empirical Results and Analysis

5.1. Data Sources and Processing Methods

5.1.1. Data Sources

(1) Sample enterprise screening: according to the CSRC Industry Classification Guidelines for Listed Companies (2012 Revision), A-share listed companies whose main business falls into the “sports” category (industry code R88) were screened. Combined with the Wind database classification of “sports industry concept stocks” and the 2024 list of leading sports concept stocks for cross-validation, 81 firms with continuous operation during 2017-2024 were ultimately retained (there were 94 A-share listed sports enterprises in 2024, of which 13 firms with incomplete data were excluded).

(2) Financial and governance data: data on enterprise market value (Value), leverage (Lev), ROE, board size, and other variables were obtained from the updated 2024 databases of CSMAR and Wind and cross-checked with the iFinD database; the deviation rate of key data was less than 2.5%.

(3) Digital transformation data: I used Python web crawling to gather annual reports from the Shanghai and Shenzhen Stock Exchanges, covering 81 firms and 648 reports from 2017 to 2024. To focus on “AI + big data + smart venues,” I updated the keyword list to catch new, high-frequency terms from 2023 and 2024-like AI video enhancement and venue brain. Then, I used Jieba word segmentation to count keyword frequencies. These counts formed the digital transformation index, Digit. To make sure the results were reliable, I manually checked a quarter of the reports. The checks came back solid—an inter-coder consistency of ICC = 0.94.

5.1.2. Processing Methods

(1) Sample screening procedure: from an initial set of 94 listed sports enterprises, 8 firms that had been delisted or suspended from listing were excluded (including ST Guoan), and 5 firms with missing financial or governance data were removed. All continuous variables were then winsorized at the 1% and 99% quantiles, producing a balanced panel of 81 firms and 648 observations.

(2) Missing-value and outlier treatment: the missing rate of continuous variables was below 1.8%, and multiple imputation was used for missing values. Outliers were handled through the combination of a Z-score rule ($|Z| > 3$) and business-logic verification.

(3) Variable standardization: financial data were uniformly converted into units of RMB 100 million, and the digital transformation index was normalized to the interval $[0, 10]$ using min-max scaling to ensure comparability across dimensions.

5.2. Descriptive Statistics and Correlation Analysis

The Wind database’s 2024 roster and the China Report Hall’s leading-stock list show 94 A-share listed sports companies. After taking out 13 firms with missing data, the sample sits at 81. These companies break down like this: 46 focus on sporting goods manufacturing, 27 on sports services, and 8 deal in sports equipment sales. This lineup matches the industrial landscape shaped by fast-moving digital sports growth in 2024. The sample represents the sector well. You’ll find the details laid out in Table 1.

Table 1. Descriptive statistics of main variables

Variable	Symbol	Obs.	Mean	Std. Dev.	Min	Median	Max	Validation note
Enterprise market value (RMB 100 million)	Value	648	92.35	68.72	13.56	72.41	358.69	Cross-checked with Wind “total market value”; deviation < 2%
Digital transformation index	Digit	648	3.12	2.18	0.32	2.65	9.41	Leading firms > 7; small firms < 3.5; consistent with AI-enabled trend
Firm size (RMB 100 million)	Size	648	62.17	46.35	9.18	49.27	245.83	Consistent with CSMAR “total assets”; no abnormal values
Ownership type	State	648	0.36	0.48	0	0	1	29 SOEs (35.8%) and 52 non-SOEs (64.2%), consistent with registration data
Leverage ratio	Lev	648	0.47	0.19	0.13	0.45	0.91	Industry average in Wind 2024 is 0.48; sample mean 0.47
Profitability	ROE	648	0.09	0.07	-0.16	0.08	0.31	Fully consistent with the 2024 annual-report ROE field

5.3. Benchmark Regression and Robustness Tests

5.3.1. Benchmark Regression Results

Table 2. Benchmark regression of digital transformation and market value of sports enterprises

Variable	(1) Value	(2) Value	(3) Value
Digit	0.168 (4.21)	0.145 (3.98)	0.139 (3.85)
Size		0.612 (7.03)	0.587 (6.89)
State		0.232 (1.96)	0.215 (1.88)
Lev		-0.256 (-2.68)	-0.239 (-2.54)
ROE		0.892 (4.57)	0.865 (4.42)
Growth		0.398 (3.46)	0.372 (3.31)
Board			0.096 (1.83)
Year FE	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
N	648	648	648
Adj-R ²	0.423	0.598	0.625

The results show that for each one-unit increase in the level of digital transformation, the market value of sports enterprises rises by approximately 13.9%. As shown in Table 2, this

finding strongly supports the hypothesis that digital transformation has a significant positive effect on the market value of sports enterprises and verifies the applicability of the resource-based view and dynamic capabilities theory in the context of the sports industry.

5.3.2. Robustness Tests

As shown in Table 3, to ensure the reliability of the benchmark regression results, the following robustness tests are conducted: replacing the dependent variable by remeasuring market value as total market capitalization plus interest-bearing debt minus monetary funds; lagging the core explanatory variable by one period to alleviate potential endogeneity; narrowing the sample period by excluding the pandemic years; and applying propensity score matching (PSM) with 1:1 nearest-neighbor matching based on Size, State, Lev, and ROE.

Table 3. Robustness test results

Test type	Method	Core coefficient (Digit)	Significance	Validation
Alternative dependent variable	Value2 = market cap + interest-bearing debt - monetary funds	0.128	p < 0.01	Compared with CSMAR enterprise value; deviation < 2.8%
Lagged core variable	Digit_lag1 (one-period lag)	0.119	p < 0.01	Lagged data complete and aligned with 2024 time nodes
Narrowed sample period	Exclude 2020-2022 pandemic samples (use 2017-2019 and 2023-2024)	0.147	p < 0.01	486 observations; distribution consistent with full sample
Propensity score matching (PSM)	1:1 nearest-neighbor matching; covariates: Size, State, Lev, ROE	0.132	p < 0.01	524 matched observations; balance test passed (standardized bias < 10%)

5.4. Mediation Analysis

Table 4. Mediation test results

Variable	(1) Value	(2) SA	(3) Value	(4) TFP	(5) Value	(6) RD	(7) Value
Digit	0.139 (3.85)	-0.201 (-3.96)	0.112 (3.28)	0.243 (4.58)	0.105 (3.12)	0.176 (4.23)	0.109 (3.18)
SA		-	-0.148 (-2.76)	-	-	-	-
TFP		-	-	-	0.172 (3.59)	-	-
RD		-	-	-	-	-	0.138 (3.35)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	648	648	648	648	648	648	648
Adj-R ²	0.625	0.452	0.651	0.518	0.668	0.485	0.662

To uncover the mechanisms through which digital transformation influences the market value of sports enterprises, three mediating variables are selected: financing constraints (measured by the SA index, where lower values indicate fewer constraints), total factor productivity (TFP), and innovation input (RD, defined as research and development expenditure divided by operating revenue). The stepwise approach developed is employed, and the estimation outcomes are displayed in Table 4.

5.4.1. The Mediating Role of Financing Constraints (SA)

Take a look at Column (2). The coefficient for Digit sits at -0.201, marked as statistically significant at the 1% level. What does that mean? Digital transformation isn't just a buzzword—it actually makes it much easier for sports firms to get the financing they need. By enforcing transparent financial reporting and gathering solid, verifiable operational data, digitalization breaks down the information gap between firms and investors. With less uncertainty, banks and investors step in more readily, whether it's for loans or equity. Now, turn to Column (3), where both Digit and SA come into play. Here, SA's coefficient registers at -0.148, significant at the 5% level. At the same time, Digit's coefficient drops to 0.112, but it's still significant at the 1% level. What does that tell us? Financing constraints act as a partial mediator in the relationship between digital transformation and access to finance. If you crunch the numbers, the mediating effect comes out to about 21.5%: $[(-0.201) \times (-0.148)] / 0.139$.

5.4.2. The Mediating Role of Total Factor Productivity (TFP)

Look at Column (4). The coefficient for Digit sits at 0.243, significant at the 1% level. That's strong evidence: digital transformation gives total factor productivity a real boost. Smart venues aren't just hype. Digital tools pare down operational bloat and let companies use big data to zero in on what users actually want. The result? Lower unit production costs. Shift to Column (5) and things get more interesting. Now, TFP's coefficient stands at 0.172, still highly significant. The Digit coefficient drops to 0.105, but it sticks at the 1% significance level. This pattern signals that TFP mediates the link between digital transformation and performance. Working through the math, the mediating effect ratio comes out to about 30.2%—the highest among the three pathways examined. So, TFP is the main channel here.

5.4.3. The Mediating Role of Innovation Input (RD)

Take a look at Column 6: Digit's coefficient sits at 0.176, and it hits significance at the 1% level. That tells us digital transformation actually drives more innovation investment in sports enterprises - not a small thing. We're seeing digital tools boost AI-driven product design, protect IP through blockchain, and use online user data to steer innovation where it matters. Switch to Column 7. Now the RD coefficient is at 0.138, still at the 1% significance level. Digit's coefficient falls to 0.109, but it keeps its significance. What's happening? Innovation input isn't just a result; it's partly mediating the effect. If you run the math - $(0.176 \times 0.138) / 0.139$ - innovation input accounts for about 17.4% of the mediating effect here.

Collectively, the three mediating pathways account for approximately 69.1% of the total effect, confirming that digital transformation primarily boosts the market value of sports enterprises by alleviating financing constraints, improving total factor productivity, and fostering innovation. Among these, the mediating role of total factor productivity is the most prominent. These findings offer a clear explanation of the transmission mechanism through which digital transformation creates value.

5.5. Configurational Analysis based on fsQCA

The foregoing regression analysis reveals the "net effect" of digital transformation, but it cannot explain how different technological elements combine to generate outcomes. Therefore, this study further employs the fsQCA method, decomposing digital transformation

into five condition variables - artificial intelligence (AI), blockchain (BC), cloud computing (CC), big data (BD), and practical application (PA) - in order to examine configurational effects[8].

The fsQCA results highlight two things: digital transformation in sports enterprises follows “multiple conjunctural causation” and “equifinality.” So, there’s no single best tech path. Different combinations work, and companies can pick the mix that fits their resources and strategies. Some focus on basic tech infrastructure (Configuration 1), others push the envelope with cutting-edge tech integrated into specific scenarios (Configuration 2), or they choose to apply mature technologies more deeply (Configuration 3). This gives sports enterprises real options, not just cookie-cutter advice. It’s a step beyond regression analysis, which tends to offer average recommendations and misses all this nuance.

6. Research Conclusion

Taking A-share listed sports enterprises as the research sample, this study systematically examines the mechanism through which digital transformation affects their market value and draws the following core conclusions:

- (1) Digital transformation can significantly enhance the market value of sports enterprises, and this conclusion remains valid after a series of robustness tests, confirming the value-creation capacity of digital technologies as strategic resources.
- (2) The fsQCA configurational analysis finds that the digital transformation paths leading to high enterprise market value are diverse. Three typical patterns are identified: the “big data-cloud computing led” pattern, the “artificial intelligence-practice integration” pattern, and the “technology-application dominated” pattern. This confirms the equifinality effect of different digital technology combinations.

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