

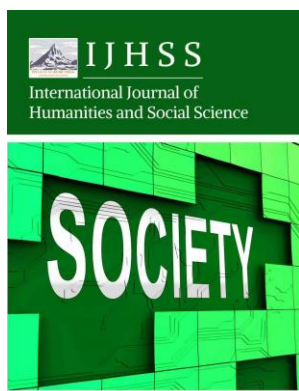
*Article*

# An Examination of the Professional Football Industry in China: Insights Derived from Big Data Analysis

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**Abstract:** This study investigates the critical challenges hindering the development of China's professional soccer industry through a big data analytical approach. Textual data were collected from major Chinese digital platforms between January 1, 2022, and October 31, 2024, and analyzed using TEXTOM, TF-IDF, sentiment analysis, and CONCOR techniques in UCINET6 and Netdraw. The findings show that financial instability, weak youth training systems, ineffective governance, and inconsistent policy implementation remain the most significant structural obstacles. Sentiment analysis further reveals strong public concern over financial transparency, coalition management, and the long-term sustainability of club operations. CONCOR analysis identifies fragmented policy execution and insufficient institutional coordination, indicating misalignment among governing bodies, clubs, and market actors. By integrating big data analytics with sport management research, this study provides a richer understanding of the systemic inefficiencies shaping China's professional soccer landscape. The results not only offer a novel methodological lens for examining industry transformation but also generate practical insights for policymakers and club administrators aiming to strengthen governance, enhance market mechanisms, and promote sustainable industry development.

**Keywords:** Chinese soccer; professional soccer industry; big data; problems

## 1. Introduction

Professional soccer, as a globalized sports industry, plays a pivotal role in promoting economic growth, cultural identity, and social cohesion [1]. The highly competitive and market-oriented nature of soccer has rendered the professional soccer industry a highly complex and dynamically changing field in the global economic system [2]. In recent years, China has witnessed advancements in its professional soccer industry, marked by the implementation of the Overall Plan for the Reform and Development of Soccer and the establishment of the Chinese Super League (CSL). Nevertheless, China's professional soccer industry continues to grapple with entrenched structural impediments [3]. A multitude of studies have identified several impediments to the advancement of professional soccer in China, including inadequate financial management by clubs, a deficient youth training system, an absence of systematic planning for professional leagues, and imperfections in market-based mechanisms [4-6]. Notably, the global competitiveness and business development capacity of Chinese professional soccer remains comparatively deficient when benchmarked against the leading five European leagues [7]. The failure of the industrial chain to establish efficient linkages is attributed

to excessive policy dependence and inflexible market mechanisms, which pose a threat to the long-term sustainable development of the industry [8].

The development theory of the professional soccer industry is predicated on the theory of sports industry structure, the theory of marketization mechanism, and the theory of organization and management [9]. A substantial corpus of relevant studies has demonstrated that the degree of marketization of the sports industry and the integrity of the industrial chain directly determine its competitiveness [10-12]. Noteworthy among the concerns of the academic community regarding China's professional soccer industry are the issues of excessive policy dependence, suboptimal operational efficiency of clubs, and underdeveloped youth training systems [13]. Ma's study revealed that the financial and operational mechanisms of Chinese professional soccer clubs are significantly imbalanced, characterized by an overreliance on government support and a dearth of market-oriented operational capabilities [14]. Furthermore, a demonstrated that this reliance hinders the marketization process of professional soccer and highlights the clubs' inadequacies in financial autonomy and operational efficiency [15].

Despite the fact that scholars have conducted studies on the reform and development of Chinese soccer, these studies have focused more on a single issue and lacked a systematic exploration of the complex relationships among issues and systematic mining of large-scale data [16,17]. Given the potential of big data technology to unveil latent patterns, dynamic trends, and intricate relationships, it is of significant academic and practical value to utilize big data analysis to comprehensively examine the challenges faced by China's professional soccer industry. The application of big data analytics in the sports field is gradually emerging, providing new tools for traditional sports research. Text Mining, Sentiment Analysis, and other techniques have been used to analyze match commentaries, fans' behavioral patterns, and club operation data [18]. However, there is a paucity of big data studies for China's professional soccer industry, with a dearth of multi-dimensional exploration based on dynamic data.

Therefore, in order to address the research gap, The objective of this study is twofold: first, to comprehensively reveal the core issues of China's professional soccer industry and its dynamic evolution law; and second, to explore the root causes of these issues and their intrinsic connections through big data analysis methods. This approach is taken to address the current lack of quantitative analysis of the complex industrial structure in academic research. Specifically, we have collected data related to China's professional soccer between 2015 and 2024 through the Textom platform. We then proceeded to analyze the salient issues and trends, employing frequency analysis, TF-IDF analysis, and sentiment analysis to identify the predominant issues and their evolving characteristics. Additionally, we have utilized cluster analysis (CONCOR) to discern the intrinsic connections between these issues, culminating in the formulation of targeted and operational policy recommendations. The objective of this research is to provide a foundation for the promotion of a healthy development of China's professional soccer industry.

The present study proposes a systematic data analysis framework, which has two primary contributions. Firstly, it offers a theoretical expansion of the research methodology in the field of sports marketing. Secondly, it provides a comprehensive understanding of the development of the professional soccer industry. This study also offers important data support and decision-making basis for policymakers and industry managers in practice. The findings of the study will contribute to the optimization of the industrial chain structure of Chinese professional soccer, the enhancement of the operational efficiency of clubs, and the promotion of the construction of fan culture and the sustainable development of the industry. This study offers innovative perspectives and reference value for the study of the sports industry.

## 2. Research Methodology

### 2.1. Data Collection & Keyword Setting

This study employs a big data methodology and aims to explore the current development status and core issues facing China's professional soccer industry. To ensure the breadth and diversity of the data sources, Baidu, China Knowledge Network (CNKI), and Google were selected as the primary channels for data collection. These platforms encompass official reports, academic research, and user perspectives in social networks, thereby providing a multi-level information foundation for the study. Textom software was utilized for data collection to ensure efficient and systematic capture of relevant text data.

With regard to the selection of keywords, the present study concentrates on the terms "professional soccer industry" and "problems of professional soccer industry." The keywords encompass the entire scope of China's professional soccer industry, while concurrently identifying the core issues that consumers and other researchers are currently concerned with. This provides a foundation for conducting in-depth analyses, with the support of data.

The designated time period for data collection extends from January 1, 2015, to December 31, 2024, encompassing the initiation of the reform, the developmental stage, and the challenges confronting China's professional soccer industry. This time span is intended to capture the dynamics of the professional soccer industry in China and its problems in the context of policy reforms, and to comprehensively show the effectiveness and shortcomings of the reform and development.

### 2.2. Data Analysis Tools and Processes

The present study employed UCINET 6 and Textom for the purpose of data analysis. Text mining, TF-IDF analysis, and sentiment analysis were performed using Textom and NetDraw with UCINET 6. Additionally, semantic web analysis and convergence of iterative correlation (CONCOR) were conducted.

## 3. Results

### 3.1. Data Analysis Results

The results of the frequency analysis of the top 50 words related to "Problems of China's soccer industry" are shown in Table 1. The 20 words with the highest frequency are Soccer (7444), China (5242), Development (2568), Industry (1715), Sports (1598), Problems (1353), Clubs (902), Reform (817), Professional (585), Leagues (475), Economy (405), Players (400), Market (397), CFA (394), Culture (393), Construction (374), National (341), WorldCup (328), Teams (300), Fans (291).

**Table 1.** Results of frequency analysis.

| Rank | Word         | Frequency | Rank | Word                | Frequency |
|------|--------------|-----------|------|---------------------|-----------|
| 1    | Soccer       | 7444      | 26   | Programs            | 246       |
| 2    | China        | 5242      | 27   | Policies            | 245       |
| 3    | Development  | 2568      | 28   | System              | 239       |
| 4    | Industry     | 1715      | 29   | Tournaments         | 239       |
| 5    | Sports       | 1598      | 30   | Professional League | 236       |
| 6    | Problems     | 1353      | 31   | Planning            | 233       |
| 7    | Clubs        | 902       | 32   | Level               | 229       |
| 8    | Reform       | 817       | 33   | Sports              | 219       |
| 9    | Professional | 585       | 34   | Capitalization      | 211       |
| 10   | Leagues      | 475       | 35   | Status              | 211       |
| 11   | Economy      | 405       | 36   | Chinesesoccer       | 183       |

|    |               |     |    |                     |     |
|----|---------------|-----|----|---------------------|-----|
| 12 | Players       | 400 | 37 | Health              | 178 |
| 13 | Market        | 397 | 38 | Professionalization | 173 |
| 14 | CFA           | 394 | 39 | CSL                 | 172 |
| 15 | Culture       | 393 | 40 | Industry Chain      | 168 |
| 16 | Construction  | 374 | 41 | Management          | 157 |
| 17 | National      | 341 | 42 | Improvement         | 146 |
| 18 | WorldCup      | 328 | 43 | Strategy            | 140 |
| 19 | Teams         | 300 | 44 | Marketization       | 126 |
| 20 | Fans          | 291 | 45 | Operation           | 124 |
| 21 | Society       | 281 | 46 | Government          | 122 |
| 22 | YouthTraining | 270 | 47 | Targets             | 119 |
| 23 | School        | 252 | 48 | Talent              | 119 |
| 24 | Youth         | 250 | 49 | SGAS                | 116 |
| 25 | Investment    | 249 | 50 | Coach               | 112 |

Notes: CFA, China Football Association; CSL, Chinese Super League; SGAS, General Administration of Sport.

The results of the TF-IDF analysis, as presented in Table 2, closely align with those derived from the frequency analysis. The outcomes are organized below in descending order, reflecting the relative significance of each term.

**Table 2.** Results of the TF-IDF analysis.

| Rank | Word          | TF-IDF | Rank | Word                | TF-IDF |
|------|---------------|--------|------|---------------------|--------|
| 1    | Development   | 2355   | 26   | Programs            | 748    |
| 2    | Sports        | 2231   | 27   | Policies            | 723    |
| 3    | Industry      | 2104   | 28   | System              | 722    |
| 4    | Soccer        | 2104   | 29   | Tournaments         | 715    |
| 5    | Problems      | 1736   | 30   | Professional League | 712    |
| 6    | Clubs         | 1713   | 31   | Planning            | 704    |
| 7    | China         | 1626   | 32   | Physical Education  | 688    |
| 8    | Reform        | 1579   | 33   | Capitalization      | 687    |
| 9    | Professional  | 1340   | 34   | Level               | 680    |
| 10   | Leagues       | 1126   | 35   | Status              | 640    |
| 11   | Culture       | 1052   | 36   | ChineseSoccer       | 594    |
| 12   | Economy       | 1031   | 37   | Professionalization | 589    |
| 13   | Players       | 1029   | 38   | Health              | 585    |
| 14   | Market        | 1028   | 39   | CSL                 | 571    |
| 15   | CFA           | 1016   | 40   | Industry Chain      | 563    |
| 16   | Construction  | 941    | 41   | Management          | 516    |
| 17   | WorldCup      | 919    | 42   | Improvement         | 487    |
| 18   | National      | 866    | 43   | Strategy            | 487    |
| 19   | Teams         | 857    | 44   | Marketization       | 478    |
| 20   | Fans          | 828    | 45   | Operation           | 443    |
| 21   | YouthTraining | 827    | 46   | Talent              | 438    |
| 22   | School        | 801    | 47   | Government          | 436    |
| 23   | Society       | 800    | 48   | Targets             | 436    |
| 24   | Youth         | 765    | 49   | Coach               | 429    |
| 25   | Investment    | 753    | 50   | SGAS                | 425    |

### 3.2. Results of Social Network Analysis

This study employs centrality to conduct a comprehensive social network analysis. Higher centrality values signify a greater number of connections between terms,

underscoring their critical influence on the overall network structure. To explore the relationships between the identified terms and the thematic focus of "Chinese soccer + industry + problem," a centrality analysis was performed. The centrality results, as detailed in Table 3, reveal the top 20 terms with the highest centrality scores, including 'Soccer'(1), 'China' (1), 'Development'(1), 'Industry'(1), 'Sports'(1), 'Problems'(1), 'Clubs'(1), 'Reform'(1), 'Professional'(1), 'Leagues'(1), 'Players'(1), 'Market'(1), 'CFA'(1), 'Culture'(1), 'Construction'(1), 'National'(1), 'WorldCup' (1), 'Teams'(1), 'Society'(1), 'YouthTraining'(1), which highlight their pivotal roles within the network.

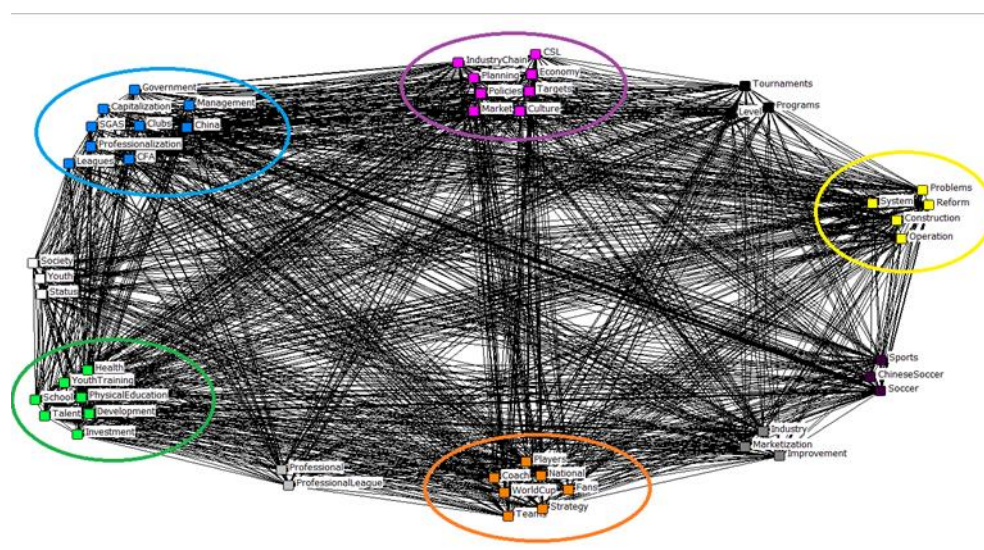
**Table 3.** Results of Centrality Analysis.

| Rank | Word               | Degree Centrality | Rank | Word                | Degree Centrality |
|------|--------------------|-------------------|------|---------------------|-------------------|
| 1    | Soccer             | 1                 | 26   | Level               | 1                 |
| 2    | China              | 1                 | 27   | PhysicalEducation   | 1                 |
| 3    | Development        | 1                 | 28   | Capitalization      | 1                 |
| 4    | Industry           | 1                 | 29   | Status              | 1                 |
| 5    | Sports             | 1                 | 30   | ChineseSoccer       | 1                 |
| 6    | Problems           | 1                 | 31   | Health              | 1                 |
| 7    | Clubs              | 1                 | 32   | Professionalization | 1                 |
| 8    | Reform             | 1                 | 33   | IndustryChain       | 1                 |
| 9    | Professional       | 1                 | 34   | Management          | 1                 |
| 10   | Leagues            | 1                 | 35   | Government          | 1                 |
| 11   | Players            | 1                 | 36   | Economy             | 0.980             |
| 12   | Market             | 1                 | 37   | Youth               | 0.980             |
| 13   | CFA                | 1                 | 38   | System              | 0.980             |
| 14   | Culture            | 1                 | 39   | Planning            | 0.980             |
| 15   | Construction       | 1                 | 40   | Improvement         | 0.980             |
| 16   | National           | 1                 | 41   | Marketization       | 0.980             |
| 17   | WorldCup           | 1                 | 42   | Operation           | 0.980             |
| 18   | Teams              | 1                 | 43   | Talent              | 0.980             |
| 19   | Society            | 1                 | 44   | Targets             | 0.980             |
| 20   | YouthTraining      | 1                 | 45   | Fans                | 0.959             |
| 21   | Investment         | 1                 | 46   | School              | 0.959             |
| 22   | Programs           | 1                 | 47   | SGAS                | 0.959             |
| 23   | Policies           | 1                 | 48   | CSL                 | 0.939             |
| 24   | Tournaments        | 1                 | 49   | Strategy            | 0.939             |
| 25   | ProfessionalLeague | 1                 | 50   | Coach               | 0.898             |

### 3.3. Results of CONCOR Analysis

This study conducted a CONCOR analysis to discuss the structure of relationships between potential subgroups within network clusters. The results are shown in Figure 1. Based on the results of the analysis, homogeneous clusters were identified and five clusters were created. The first cluster (blue): 'Government', 'Capitalization', 'SGAS', 'Professionalization', 'Clubs', 'Management', 'China', 'Leagues', and 'CFA' for 'Industry management structure'. Group 2 (green): 'Youth Training', 'Health', 'Physical Education', 'Talent', 'Investment', 'School', 'Development' for 'Youth Training and Talent Development'.





**Figure 1.** 1. Blue: Industry Management Structure, 2. Green: Youth Training and Talent Cultivation, 3. Purple: Marketization of Professional League, 4. Orange: Economic Level of Chinese Football, 5. Yellow: Structural Problems and Reforms.

Group 3 (purple): comprising 'CSL', 'Industry Chain', 'Economy', 'Policies', 'Targets', 'Planning', 'Market', 'Culture' for 'Marketization of professional leagues'. Group 4 (Orange): consists of 'Teams', 'Players', 'Coach', 'National', 'Strategy', 'World Cup', 'Fans', representing 'Chinese Football Athletic Level'. Group 5 (yellow): 'Problems', 'Reform', 'System', 'Construction', 'Operation' constitute 'Structural Problems and Reform'.

#### 4. Discussion

This study presents a comprehensive examination of the structural challenges and developmental constraints within China's professional soccer industry by leveraging big data analytics.

Firstly, the frequency analysis results indicate that discussions surrounding China's professional soccer industry are largely dominated by structural and policy-related themes. The frequent occurrence of terms such as 'Soccer,' 'China,' 'Development,' 'Industry,' and 'Problems' highlights the ongoing discourse on industrial growth and institutional inefficiencies. Notably, the prevalence of words like 'Reform' and 'Professional' suggests that policy interventions remain central to the industry's development, reinforcing prior research that emphasizes the dominance of government-led initiatives in China's sports sector [19].

Secondly, the results of the TF-IDF analysis align closely with the frequency analysis, revealing that governance and market-related terms such as 'CFA' (Chinese Football Association), 'Leagues,' 'Economy,' and 'Market' play a crucial role in shaping industry discussions. These findings suggest that financial instability, insufficient commercial viability, and the over-reliance on state support are key obstacles to achieving a sustainable professional soccer industry. This aligns with established sports economic theories, which argue that a successful professional sports industry requires strong market-driven mechanisms and diversified revenue streams [20]. The emphasis on economic sustainability within the dataset further supports the notion that Chinese soccer clubs struggle with financial independence, an issue that has been previously documented in studies of sports marketization in emerging economies [21].

Furthermore, the results of the social network analysis demonstrate significant interconnections between governance, economic viability, and international competitiveness. Higher centrality values for terms such as 'CFA,' 'Reform,' 'Market,' 'Economy,' 'WorldCup,' and 'Teams' indicate that structural inefficiencies, fragmented

governance, and weak commercial linkages continue to hinder the industry's global standing. These results highlight systemic challenges where policy measures attempt to compensate for market failures, often reinforcing a cyclical dependency on regulatory oversight rather than fostering organic market evolution. Prior research has similarly emphasized that regulatory-heavy sports markets often struggle to transition toward commercially sustainable models, further exacerbating inefficiencies in governance and competitiveness [22].

In addition, the CONCOR analysis categorizes the key themes influencing China's professional soccer industry into four distinct but interrelated domains: governance and institutional regulation, marketization and commercial viability, talent development and professionalization, and international competitiveness and global integration. The governance cluster reveals that CFA-led policies continue to dominate discussions, reflecting a centralized regulatory approach that has long characterized China's sports governance [23]. The marketization cluster underscores financial instability, with persistent concerns over economic sustainability and club financial management. Talent development remains a critical issue, as the limited presence of systematic youth training programs constrains the long-term growth and professionalization of the league [24]. Lastly, the discourse on international competitiveness suggests that despite aspirations for global integration, Chinese professional soccer still faces considerable gaps in performance standards compared to leading international leagues [25].

These findings suggest that while policy-driven advancements have played a role in shaping China's professional soccer industry, they have not yet addressed the fundamental structural challenges that hinder sustainable growth. The predominance of governance-related discussions highlights the continued reliance on regulatory bodies rather than market mechanisms as the primary driver of industry development. Moreover, the lack of significant consumer engagement and grassroots-level development within the analyzed dataset suggests an absence of bottom-up market stimulation, which is essential for long-term industry viability. These findings contribute to the broader discourse on sports industry governance by illustrating how policy-market interactions shape the trajectory of professional leagues in emerging economies.

## 5. Conclusion

Although policy-driven advances have contributed to the evolution of China's professional soccer industry, these efforts have yet to address the fundamental structural impediments that hinder sustainable growth. The preeminence of governance-related discourse underscores the prevailing reliance on regulatory oversight as the primary catalyst for industry advancement, rather than leveraging market-driven mechanisms. Moreover, the absence of substantial consumer engagement and grassroots development in the examined datasets indicates a deficiency in bottom-up market stimulation, a critical element for ensuring the long-term viability of the industry.

### 5.1. Theoretical Contribution

This study contributes to the theoretical understanding of governance-market dynamics in professional sports by employing big data analytics to examine China's professional soccer industry. The findings underscore how regulatory dominance impedes organic market development, thereby reinforcing state-led sports industry theories. By identifying governance, marketization, talent development, and international competitiveness as pivotal challenges, this research offers a novel classification framework. Furthermore, it extends the application of computational social science in sports management, demonstrating the value of network and textual analysis in uncovering latent structural inefficiencies within an industry undergoing transformation.

### 5.2. Managerial Implications

The study offers actionable insights for policymakers and industry stakeholders. It underscores the necessity for a gradual transition toward a market-driven governance model, thereby reducing reliance on state interventions. The enhancement of youth training systems, the diversification of revenue streams, and the integration of global best practices can foster industry sustainability. Clubs should adopt digital engagement and commercialization strategies to improve financial viability and long-term competitiveness.

### 5.3. Limitations and Future Research

This study is not without its limitations. The textual big data approach that was employed resulted in the exclusion of the in-depth perspectives of key stakeholders. In the future, research should include qualitative interviews and an analysis of policy documents to gain a comprehensive perspective. Comparative studies of other emerging sports economies could enhance generalizability and provide broader insights into the development of the professional sports industry in different regulatory and cultural contexts.

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