

Data-Driven Smart Governance for National Fitness Public Services

Qing Han

School of Medical Technology and Information Engineering, Zhejiang Chinese Medical University, Hangzhou 310053, China

Abstract: In the context of China's Healthy China 2030 strategy and the rapid advancement of digital government initiatives, the governance of national fitness public services is undergoing a profound transformation. Traditional governance models characterized by fragmented supply, administrative centralization, and passive service delivery are increasingly challenged by the need for real-time responsiveness, personalization, and systemic coordination. This study explores the logic, structure, and pathways of data-driven smart governance in national fitness services. Drawing on the theoretical frameworks of data-driven governance and intelligent public service transformation, this paper first identifies the key governance dilemmas in the current national fitness system, including regional disparities, data fragmentation, and limited stakeholder participation. It then constructs a closed-loop governance mechanism comprising four layers: sensing, analysis, decision-making, and feedback. On this basis, the study proposes a three-dimensional governance pathway technological, organizational, and institutional, emphasizing platform integration, multi-actor collaboration, and regulatory support. This framework redefines the logic of service delivery, shifting from static, experience-based models to dynamic, algorithm-enabled governance systems. The findings offer both theoretical contributions to the field of smart governance and practical insights for improving the performance, equity, and adaptability of fitness-related public services.

Keywords: national fitness; data-driven governance; public service; smart city; smart governance; digital platform

1. Introduction

As a critical strategy to enhance national health literacy and public well-being, national fitness has been integrated into China's top-level policy agenda. Strategic documents such as the Healthy China 2030 Plan and the National Fitness Plan (2021–2025) explicitly call for the construction of a more complete and intelligent public service system for national fitness, promoting the equitable allocation of resources and accelerating digital and intelligent transformation. However, challenges such as uneven distribution of services, delayed responses, fragmented information systems, and low citizen engagement persist, especially at the “last mile” of service delivery.

With the rapid advancement of digital technologies such as big data, artificial intelligence (AI), and cloud computing, public service governance is undergoing fundamental transformation. Data has evolved from a

passive support tool into a core element and active driver of governance innovation [1]. In the field of national fitness, a closed-loop process involving data sensing, intelligent analysis, scientific decision-making, precise feedback is reconstructing the logic of service delivery and improving governance responsiveness. In this context, there is an urgent need to explore governance mechanisms and design replicable and sustainable data-driven pathways for digital-intelligent governance of national fitness public services.

This study adopts a dual theoretical lens: data-driven governance and intelligent transformation of public services. Data-driven governance emphasizes data as a primary production factor and governance resource, leveraging data collection, cleansing, analysis, and predictive modeling to support policy formulation and service provision [2]. It marks a paradigmatic shift from experience-based judgment to algorithmic decision-making, enhancing real-time perception and predictive response capabilities. Concurrently, public services are evolving from digitization toward intelligentization, characterized by platformization, algorithmic governance, and collaborative service design [3]. Focusing on national fitness public services, this study seeks to construct an operable, scalable model of intelligent governance grounded in data. Specifically, it addresses the following questions: (1) What are the core governance challenges in current national fitness services? (2) How does data-driven governance function across sensing, analysis, decision-making, and feedback processes? (3) How can a sustainable, generalizable governance pathway be designed to modernize the national fitness service system?

Through a comprehensive review of domestic and international literature, this study extracts key governance challenges, builds a logic model of data-driven governance, and proposes a three-dimensional governance pathway consisting of technology, organization, and institutional design. The goal is to produce outcomes that are both theoretically grounded and practically applicable.

2. Data-Driven Mechanisms in National Fitness Public Service Governance

2.1. Governance Challenges in National Fitness Public Services

Despite increasing investment in facilities and services under national strategies such as Healthy China and National Fitness, the governance of public fitness services still faces significant structural challenges. First, there is a pronounced regional imbalance in resource allocation. Urban areas have dense facility coverage, while rural and peripheral areas suffer from sparse infrastructure, leading to unequal access to fitness opportunities [4]. Second, data systems across government levels and platforms remain fragmented. Disparate standards and poor interoperability hinder the integration of user behavior data and venue operations data [5]. Third, the current service model is largely static and generic, with platforms primarily functioning as bulletin boards rather than intelligent recommendation engines. Lastly, governance remains overly centralized, with insufficient participation from social organizations, enterprises, and citizens [6]. These issues reflect a breakdown in the governance chain and necessitate a transition to new governance logic.

2.2. The Logic and Applicability of Data-Driven Governance

Data-driven governance represents an emerging paradigm that leverages data as a strategic resource for real-time sensing, predictive modeling, and personalized services [7]. It encompasses four key components: sensing, analysis, decision-making, and feedback, forming a closed-loop cycle of data, insight, and action [8]. This model is particularly well-suited for national fitness governance. With the proliferation of wearable devices, fitness apps, and urban IoT infrastructure, user activity data, facility usage, and movement patterns can be captured in real time. Concurrently, machine learning algorithms enable platforms to model user preferences, forecast demand trends, and offer personalized service recommendations [9]. Beyond enhancing allocation efficiency, data-driven governance fosters multi-actor collaboration, facilitating a shift from experience-based to algorithm-enabled decision-making and from reactive to proactive governance.

2.3. Core Components of Data-Driven Smart Governance in Fitness Services

Based on the above logic, this study proposes a smart governance framework consisting of four core components: sensing, analysis, decision-making, and feedback, forming a closed-loop system for dynamic

service optimization. This framework holds not only theoretical significance but also strong practical applicability for scaling and implementation.

(1) the sensing layer is responsible for real-time collection of multi-source data. Through fitness apps, WeChat mini-programs, smart venues, and video surveillance systems, data on users' exercise types, frequency, time, and geographic location can be captured. In addition, Internet of Things (IoT) devices and third-party data platforms enable the integration of unstructured data such as facility usage, equipment status, and environmental indicators, thereby constructing comprehensive digital profiles of user behavior within the national fitness ecosystem.

(2) the analysis layer processes the collected data through fusion, cleaning, and modeling. By leveraging clustering analysis, time-series forecasting, and machine learning techniques, this layer identifies user preferences, predicts resource congestion, and detects service blind spots, thereby enabling predictive governance and scenario-based planning. The modeling process enhances both the foresight of decision-making and the personalization of service delivery.

(3) the decision-making layer translates insights from data analysis into actionable strategies for resource allocation and service provision. By building optimization models and rule-based engines, the platform can support intelligent operations such as activity recommendations, coach-user matching, and venue scheduling, which in turn reduce resource waste and improve service efficiency. Moreover, this layer can incorporate policy rules to enable coordinated governance based on both data and policy directives.

(4) the feedback layer closes the governance loop. User feedback—collected via ratings, surveys, and usage data—is captured in real time, allowing the system to iterate through “re-sensing → re-analysis → re-optimization,” thereby enabling adaptive and continuously evolving governance. This mechanism not only enhances the responsiveness of service delivery but also endows the system with self-correcting capabilities.

Compared to traditional, department-centered, linear governance models that are often rigid and segmented, the proposed data-driven smart governance framework delivers systemic value across structure, logic, and outcome dimensions. Structurally, it emphasizes platform-based integration, enabling interdepartmental data sharing and resource coordination. Logically, it promotes algorithmic decision-making, replacing subjective judgment with AI-enabled analysis to improve the scientific rigor, timeliness, and adaptability of decisions. In terms of service provision, it advocates for collaborative delivery, building a multi-stakeholder service network led by government, supported by enterprises, and co-produced by communities. Process-wise, it reinforces intelligent feedback mechanisms, which leverage user behavior and service evaluation data to drive rapid optimization and upgrade. Therefore, the data-driven smart governance framework for national fitness public services is not merely a technological choice, representing a paradigm shift in public service governance. It lays a robust theoretical and practical foundation for the development of a more efficient, collaborative, and intelligent governance ecosystem.

3. Designing Data-Driven Governance Pathways for National Fitness

Building upon the governance framework outlined above, this chapter proposes a three-dimensional governance pathway focusing on: (1) technological infrastructure, (2) organizational restructuring, and (3) institutional support. This integrated pathway reflects the logic of data-centric governance, multi-stakeholder coordination, and rule-based policy embedding.

3.1. Technological Pathway

At the technological level, the construction of a data-intelligent governance pathway must rely on two foundational pillars: a unified smart platform architecture and robust data processing capabilities. First, it is essential to establish an integrated National Fitness Smart Governance Platform that breaks through departmental silos and enables cross-regional, cross-level, and cross-terminal data aggregation and integrated management. This platform should feature a user-friendly interface, open data APIs, and embedded algorithmic models. It must also achieve seamless interoperability with existing systems such as health code infrastructures, smart city platforms, and community governance systems, thereby functioning as a city-level data hub for fitness services. Second, the platform must be equipped with the capacity for multi-source data fusion and

processing, capable of accessing both structured data (e.g., demographic profiles, venue inventories, facility registries) and unstructured data (e.g., user movement trajectories, social media texts, and video surveillance feeds) in real time. Utilizing cloud computing and big data frameworks, the platform should support dynamic modeling and real-time analysis. In addition, embedded AI models should possess self-learning, predictive, and recommendation capabilities. These would enable functions such as personalized fitness content delivery, intelligent allocation of venue resources, and early warning for congestion hotspots, thereby enhancing the responsiveness and accuracy of public service provision. The ultimate goal of the technological pathway is not merely to build an information system, but to establish a “platform-as-governance” paradigm. This marks a full-scale transformation from traditional offline service provision toward intelligent, data-driven, and precision-based public service delivery.

3.2. *Organizational Pathway*

The advancement of data-intelligent governance involves not only technological upgrades, but also the restructuring of organizational systems. The traditional governance model characterized by a government-led, citizen-passive dynamic is no longer adequate to meet the complex and evolving service demands of the data era. It is therefore imperative to establish a collaborative governance framework centered around four core actors: government, platforms, social organizations, and users.

First, the role of government should shift from direct service provider to platform rule-setter, focusing on the development of operational protocols, data security standards, and algorithmic ethics guidelines. Additionally, the government should encourage broad participation by market entities and civil society in public service delivery. For example, sports authorities can establish a smart fitness service procurement catalogue, enabling public procurement of intelligent fitness services from NGOs and tech enterprises, thereby diversifying public service supply. Second, platform enterprises serve as technological intermediaries within the governance ecosystem. They are not only responsible for the operation and maintenance of data systems and the continuous optimization of algorithmic models, but must also adjust service structures dynamically based on user feedback. This reflects the governance logic of platform-as-a-service. Third, community-based organizations including fitness volunteers and grassroots sports associations should be actively encouraged to participate in governance. Their involvement fosters a data-driven and community co-governance service model, which enhances local contextual adaptability and extends governance to the service endpoints. Finally, users should evolve from passive recipients to co-creators of data and active feedback participants. Through rating systems, behavioral data, and satisfaction evaluations, users provide valuable feedback that informs continuous service improvement, transforming governance from a closed decision-making process into an open, collaborative ecosystem [10].

3.3. *Institutional Pathway*

Even the most advanced technologies and the most diverse organizational structures cannot ensure sustainable development without a strong foundation of institutional support. Therefore, it is essential to establish a comprehensive institutional framework to accompany the development of data-intelligent governance in national fitness public services. First, a robust data governance regulatory system must be developed, encompassing mechanisms for lawful data collection, privacy protection agreements, platform accountability delineation, and algorithmic transparency standards. This is especially important in scenarios where behavioral data and health-related data are cross-utilized, requiring strict legal and ethical safeguards to prevent data misuse, discriminatory recommendations, or violations of user rights. Second, a performance evaluation mechanism should be established for platform operations. This mechanism should assess indicators such as the precision of service delivery, user satisfaction, data processing efficiency, and system openness. Moreover, performance results should be tied to financial incentives, such as government subsidies or project funding, to guide platforms toward the continuous optimization of service models and technical architectures. Third, a market access and exit mechanism for public service platforms should be introduced. This includes clearly defined standards for technical service provider qualifications, performance assessments, and exit procedures, thereby ensuring a healthy, competitive, and compliant platform ecosystem. Finally, a set of data sharing and

interoperability standards should be formulated specifically for national fitness services. These standards should enable seamless data exchange among governments at various levels, platform enterprises, and community-level actors, breaking down existing information silos and constructing a collaborative data environment. Such an environment would provide the institutional infrastructure necessary for the ongoing iteration and intelligent evolution of the national fitness public service system [11].

4. Conclusions and Future Directions

Against the backdrop of the ongoing Healthy China strategy and the rapid advancement of digital government initiatives, China's national fitness public service system is undergoing a profound transformation from a traditional supply-driven model to one characterized by data-driven smart governance [12]. This study adopts a data-centric perspective to systematically examine the governance challenges currently facing national fitness services. It analyzes the logic and operational mechanisms of data-driven governance, and proposes a smart governance framework based on a closed-loop structure of sensing, analysis, decision-making, and feedback. Building on this foundation, the paper further develops a three-dimensional governance pathway, encompassing the technological, organizational, and institutional dimensions, to construct a framework that is operational, scalable, and sustainable.

The findings suggest that data is not merely a support element in public service delivery, but a core driver of governance innovation. In the field of national fitness, data-driven governance plays a critical role in breaking down information silos, improving resource matching efficiency, enhancing service responsiveness, and fostering multi-actor collaboration among governments, platforms, social organizations, and users. Moreover, smart governance platforms should not be viewed solely as technical tools, but as carriers of a new governance paradigm. Their effective operation relies on the coordinated integration of institutional mechanisms, organizational structures, and user engagement to realize the shift from static supply to intelligent responsiveness.

Despite its comprehensive theoretical construction and pathway design, this study acknowledges several limitations. It does not include empirical validation or case studies; hence, the proposed mechanisms and pathways require further practical testing. In the technological domain, critical aspects such as data integration methods, algorithm model selection, and privacy protection mechanisms have not been deeply explored, and should be examined in future research based on real-world platforms or urban contexts. Furthermore, given the diversity of regional contexts and the flexibility of policy implementation, governance pathways for national fitness services may vary in priority and adaptability across different areas. In summary, this study contributes a novel theoretical framework for the modernization of public service governance in the sports sector. It enriches the application of data-driven governance theory in the domain of sports management and provides structural support for designing smart public service governance models. From a practical perspective, the proposed governance pathway offers actionable insights for national, provincial, and local sports authorities as they build smart fitness platforms, design supporting policy systems, and promote intelligent service transformation.

Funding

This research was funded by Hangzhou Municipal Philosophy and Social Science Planning Project (NO. 2022JD24).

Institutional Review Board Statement

Not applicable.

Informed Consent Statement

Not applicable.

Data Availability Statement

Not applicable.

Conflicts of Interest

The author declares no conflict of interest.

References

- 1 Janssen M, Helbig N. Innovating and Changing the Policy-Cycle: Policy-Makers Be Prepared! *Government Information Quarterly* 2018; **35**(4): S99–S105. <https://doi.org/10.1016/j.giq.2015.11.009>.
- 2 Stuart D. The Data Revolution: Big Data, Open Data, Data Infrastructures and Their Consequences. *Online Information Review* 2015; **39**(2): 272. <https://doi.org/10.1108/OIR-01-2015-0011>.
- 3 Dunleavy P, Margetts H. Data Science, Artificial Intelligence and the Third Wave of Digital Era Governance. *Public Policy and Administration* 2025; **40**(2): 185–214. <https://doi.org/10.1177/09520767231198737>.
- 4 Gao B, Shen K. Research on the Implementation Path of Supply-Side Reform of Public Fitness Services. *Sports Research and Education* 2020; **35**(1): 41–46.
- 5 Zhang R, Zhang Y, Wang Z. Research on the Construction of a Higher Level of Public Service System for National Fitness under the Perspective of New Quality Productivity. *Journal of Beijing Sport University* 2024; **47**(10): 67–76.
- 6 Chen C, Chen N. Building a Higher-Level Public Service System for National Fitness: Foundation, Focus and Practice. *Journal of Shanghai Sport University* 2024; **48**(7): 43–55.
- 7 Janssen M, Kuk G. The Challenges and Limits of Big Data Algorithms in Technocratic Governance. *Government Information Quarterly* 2016; **33**(3): 371–377. <https://doi.org/10.1016/j.giq.2016.08.011>.
- 8 Kitchin R. The Real-Time City? Big Data and Smart Urbanism. *GeoJournal* 2014; **79**(1): 1–14. <https://doi.org/10.1007/s10708-013-9516-8>.
- 9 Ma H, Yang J. Public Governance Reform Driven by Big Data: Basic Logic and Action Framework. *Chinese Public Administration* 2018; **(12)**: 42–46.
- 10 Mergel I, Edelmann N, Haug N. Defining Digital Transformation: Results from Expert Interviews. *Government Information Quarterly* 2019; **36**(4): 101385. <https://doi.org/10.1016/j.giq.2019.06.002>.
- 11 Mora L, Deakin M, Reid A. Smart-City Development Paths: Insights from the First Two Decades of Research. In *Smart and Sustainable Planning for Cities and Regions*; Springer International Publishing: Cham, Switzerland, 2018; pp. 403–427.
- 12 Gao X, Cao L, Gu Q. Assessing the Efficiency of China's National Fitness Public Services: A Super-Efficiency DEA-Malmquist-Tobit Approach. *Frontiers in Public Health* 2024; **12**: 1433337.

