
Original Research Article

Research on digital empowerment pathways for high-quality development of sports in private universities

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Abstract: Through literature review, research surveys, and case studies, it systematically examines the practical basis and value implications of such integration. The paper actively investigates the logical mechanisms, practical challenges, and implementation strategies of digital technology in promoting high-quality development of physical education in private universities. With the rapid advancement of technologies such as cloud computing, big data, and artificial intelligence, digital empowerment has become a crucial approach to fostering innovation in university sports.

Keywords: digital empowerment; private universities; university physical education

1. Introduction

Amid the national strategy of "Digital China" and the ongoing digital transformation of education, physical education—As a vital component of the talent development system in higher education—Is facing a critical opportunity to transition from traditional models to smart and personalized approaches. From a theoretical perspective, research on the digital empowerment of physical education in private universities can enrich the application scenarios of digital education transformation theory within the domain of sports education, and help construct a theoretical framework for digital sports development tailored to the characteristics of private institutions.

2. Current research status on digital empowerment for high-quality development of physical education in private universities

Research on the integration of digital technology and physical education in foreign higher education institutions started relatively early, with a primary focus on the following areas: firstly,

The development of intelligent sports teaching systems, such as the VR sports training system developed by Stanford University in the United States, which uses virtual reality technology to simulate sports scenarios, enhancing the immersion and safety of student training; secondly, the application of sports big data, exemplified by the University of Cambridge in the UK, which utilizes wearable devices to collect student exercise data and constructs personalized exercise prescription models; thirdly, the digital transformation of sports management, where German universities commonly adopt smart sports management platforms to achieve integrated operations for venue reservations, course management, and physical fitness monitoring.

3. The value logic of digital empowerment for high-quality development of physical education in private universities

3.1. Improving resource utilization efficiency

Digital empowerment enables intelligent scheduling and management of public sports facilities, thereby

enhancing resource utilization efficiency and addressing issues of uneven resource allocation. By integrating advanced technologies such as the Internet of Things, big data, and cloud computing, digital empowerment facilitates real-time monitoring of facility usage, automated data collection and analysis, and intelligent decision-making based on data insights ^[1].

3.2. Addressing uneven resource distribution

Traditional sports facility management often suffers from imbalanced resource allocation, where certain regions or time slots experience over-utilization while others remain under-utilized. Digital empowerment in sports requires individuals to possess essential attitudes, awareness, knowledge, and skills for digital application. Schools and social organizations must develop digital literacy to effectively identify, systematize, summarize, analyze, and innovate in implementing digital sports initiatives. However, the current digital transformation of physical education in private universities faces challenges such as hierarchical disparities in digital technology access, uneven distribution of infrastructure resources, and slow database development. Digital empowerment can optimize the allocation of facility resources through data analysis and predictive modeling ^[2].

3.3. Enhancing digital intelligence service quality

Digital approaches enable the provision of more diverse and rich fitness knowledge and services, catering to personalized fitness needs and improving overall service quality. The application of digital technologies improves operational efficiency and convenience ^[3], exemplified by smart reservation systems. Enhanced interactivity allows public sports services to foster stronger engagement through social media and online forums, strengthening participants' sense of involvement and belonging. Service innovation is driven by digital empowerment, as seen in the use of virtual reality (VR) and augmented reality (AR) technologies, which enable users to engage in simulated training and virtual competitions from home ^[4].

4. Practical challenges in digital empowerment for high-quality development of physical education in private universities

4.1. Bottlenecks in teaching and technical talent allocation

Survey data indicate that physical education courses in most private universities remain predominantly traditional and classroom-based, with online physical education electives offered only in theoretical foundation courses, reflecting a serious lag in the development of digital teaching resources.

4.2. Digital divide and regional development disparities

The application of digital and sports technologies requires sustained financial investment, such as the construction and maintenance of smart sports management platforms. Due to differences in economic, cultural, and educational conditions, significant disparities exist among different populations in accessing and using digital technologies. The high construction costs of digital fitness products and services may be unaffordable for slower-developing regions, preventing them from benefiting from the convenience and advantages of digital fitness services. This situation exacerbates the digital divide in regional education inequality ^[5].

4.3. Quality and stability of digital services

While a wide variety of digital sports tools are available, their service quality and stability remain inconsistent. In the context of university sports and public fitness, digital services often rely on advanced technologies and platforms, many of which suffer from insufficient technological maturity or instability. In

practice, however, many services adopt a one-size-fits-all or template-based approach, failing to accommodate diverse user requirements. This lack of customization reduces user satisfaction and undermines the reputation of digital services ^[6].

4.4. Data security and privacy protection

Student participation rates in physical activities at private universities exhibit an "inverted U-shaped" pattern, indicating that traditional sports formats struggle to meet the personalized demands of the new generation of students. Most institutions have yet to establish robust data security management systems, leaving collected and analyzed data vulnerable to potential leakage ^[7].

5. Implementation pathways for digital empowerment of high-quality development in private university sports

5.1. Enhancing teaching capacity and optimizing talent allocation

To address the bottleneck in technical talent allocation among teaching staff, the following pathways can be pursued to promote the high-quality development of sports in private universities through digital empowerment: In terms of talent development, collaboration with enterprises can be established to conduct "dual-qualified" teacher training programs, offering specialized courses such as digital sports technology application and sports data analysis. These initiatives aim to enhance teachers' ability to utilize digital tools and integrate them into teaching practices. Additionally, the establishment of on-campus digital sports innovation workshops can encourage collaborative development of virtual simulation courses and digital teaching resources among educators.

5.2. Strengthening data security and privacy protection

A robust mechanism for data security and privacy protection should be established, incorporating technical measures such as encryption and desensitization to safeguard user data. Simultaneously, user education and awareness campaigns must be enhanced to increase understanding of data security and privacy protection. Key measures include: Improving Legal and Regulatory Frameworks: Refining laws and regulations related to data security and privacy protection, clarifying standards and norms for data collection, processing, storage, and usage.

5.3. Bridging the digital divide and regional disparities

Policy guidance and educational training should be implemented to enhance the awareness and operational capabilities of digital technologies among disadvantaged groups. Enterprises and institutions are encouraged to strengthen infrastructure development, increasing investment in network infrastructure in remote and underdeveloped regions to improve internet coverage and speed.

5.4. Improving the quality and stability of digital services

Increased investment in technological research and development is essential to enhance the maturity and stability of digital platforms and technologies. Collaboration with other technology providers should be strengthened to jointly promote technological progress and innovation. To ensure data quality and accuracy, standardized and normalized processes for data collection, processing, and analysis must be established. A monitoring and evaluation mechanism for data quality should also be implemented to promptly identify and rectify issues. Service content and personalized experiences need to be optimized by gaining in-depth insights

into user needs and preferences, thereby providing customized fitness plans and guidance.

6. Implementation suggestions for digital empowerment of high-quality development in private university sports

6.1. Government level

The government should introduce relevant policies to clarify the goals and direction of digital empowerment for high-quality development in private university sports. A unified fitness data platform should be established to integrate data resources from government, society, schools, and other stakeholders, enabling data sharing and interoperability to support personalized fitness services. Furthermore, a robust regulatory mechanism for digital fitness services must be developed to ensure service quality and data security. Regular evaluations of digital fitness services should be conducted to facilitate timely adjustments and optimizations of related policies and services.

6.2. Societal level

Enterprises should be encouraged to increase investment in research and development to promote the innovative application of technologies such as cloud computing, big data, and artificial intelligence in the fitness sector, thereby improving service quality and user experience. Efforts to strengthen brand building and market promotion will enhance the visibility and reputation of digital fitness products, attracting more user attention and participation. Additionally, collaboration and exchange at the societal level should be enhanced to jointly advance the digital empowerment of high-quality development in private university sports, achieving mutual benefits and win-win outcomes.

6.3. Institutional level

Educational institutions should establish communication platforms connecting the government, society, and individuals to facilitate dialogue and cooperation in advancing the digital empowerment of high-quality sports development in private universities. Diverse public benefit activities—such as health lectures and fitness competitions—should be actively organized to raise student awareness and engagement. Furthermore, promoting healthy lifestyles and fitness culture will help improve student health literacy and exercise awareness, creating a favorable environment for digitally empowered high-quality development in university sports.

6.4. Individual level

Students should actively participate in various digital fitness activities and services to benefit from the convenience and efficiency offered by digital technologies, thereby improving their physical fitness and overall health. Sharing personal fitness experiences and insights with others can help disseminate healthy lifestyles and fitness culture, contributing to the digital empowerment of sports development in private universities. Additionally, providing suggestions and feedback to government agencies, social organizations, and educational institutions will facilitate the continuous optimization and improvement of digital fitness services.

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