

智慧体育场景下太极拳数字化服务创新研究

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摘要：在“健康中国”与数字经济深度融合的时代背景下，以数据驱动、智能交互、场景融合为特征的智慧体育，正深刻重塑着国民的体育生活方式与健康管理模式。太极拳作为兼具健身、康养与文化遗产多重价值的民族传统体育项目，其数字化发展正经历着从单一“产品供给”向多元“服务创新”的结构性转型。然而，当前太极拳数字化服务仍面临着技术与文化融合不深、用户体验同质化、价值链条单一等发展瓶颈。**目的：**本研究旨在构建一个系统性的太极拳数字化服务创新理论框架，以驱动其服务模式的范式跃迁，以期太极拳数字化服务创新提供系统性的理论阐释与实践路径。**方法：**本研究主要采用理论建构与案例分析相结合的研究方法。在理论层面，系统梳理智慧体育、服务设计、价值共创以及场景理论等相关文献，构建一个具有解释力的跨学科理论模型。在实践层面，选取当前国内外具有代表性的智慧体育应用（如 Keep、Peloton）、数字化康养平台以及太极拳数字化服务创新案例（如 AR 太极智慧屏、AI 动作评估系统等），对其技术架构、服务流程、商业模式与用户体验进行深度剖析，用以验证、修正并丰富本文提出的理论框架。**结果：**（1）个性化与预测性服务，利用 AI 算法与可穿戴设备收集的用户健康数据（如心率、平衡能力、活动规律）与运动数据（如动作精准度、习练频率），为用户建立个人数字健康档案。基于此，AI 教练不仅能提供千人千面的个性化习练计划，更能基于数据趋势进行健康风险预测，并主动推送预防性、干预性的太极拳康养方案。（2）沉浸式与交互式体验，运用 VR/AR 技术，将用户从二维屏幕的观看者，转变为三维虚拟空间的参与者。用户可以在虚拟的武当山巅跟随张三丰学拳，也可以通过 AR 将虚拟教练投影在家中客厅进行 1 对 1 指导。这种沉浸式体验极大地提升了学习的趣味性与身体的“在场感”，有效解决了传统线上教学“体悟”不足的痛点。（3）多模态感知与智能反馈，结合计算机视觉与多传感器融合技术，智慧终端（如智慧屏、智能镜）能够精准捕捉用户的全身骨骼点，实时分析其动作的幅度、速度、稳定性，并通过语音、图像、甚至光影等多种方式给予即时、精准的反馈。这使得原本依赖于教练现场指导的“形体纠偏”得以自动化与普惠化。（4）智慧社区与居家康养场景，在智慧社区，AR 太极智慧大屏、户外智能健身路径可以成为居民便捷的习练入口。在家中，智能电视、智能音箱可以一键开启太极拳练习模式，并与家庭健康监测设备联动，形成集“练

习-监测-反馈-管理”于一体的闭环式居家康养服务。（5）智慧文旅与沉浸式体验场景，在太极拳文化发源地等旅游景区，游客可以通过 AR 导览应用，与历史上的太极宗师进行虚拟互动，学习一招半式，实现“身临其境”的文化体验。这种“体育+文旅”的深度融合，将太极拳从单纯的健身项目，转变为一种可体验、可消费的文化旅游产品。（6）数字医疗与主动健康场景，将经过循证医学验证的太极拳处方（如针对帕金森病、骨质疏松症的特定套路）开发为专业的数字疗法（Digital Therapeutics）应用，并纳入医疗保险与公共卫生服务体系。患者可在医生指导下，通过该应用进行辅助康复训练，其练习数据可回传至医疗系统，作为临床评估与治疗方案调整的依据。（7）开放式内容创作平台（UGC/PGC），鼓励并赋能用户（UGC）与专业教练（PGC）在平台上分享自己的习练心得、教学视频、改编套路、配乐创作等。平台提供易用的创作工具与流量扶持，形成一个丰富多元、持续更新的内容生态，满足不同层次用户的细分需求。（8）社群化激励与知识共享机制，构建线上线下联动的太极拳数字社群。通过积分、勋章、排行榜等游戏化设计，激励用户坚持练习、分享成果。定期组织线上“云比赛”、名家直播答疑、线下主题交流会等活动，促进知识的流动与社群成员间的情感联结，将个体化的练习行为，转化为具有社会属性的集体实践。（9）多主体协同的服务生态构建，平台方应积极链接政府（如体育局、卫健委）、医疗机构、康养中心、文旅企业、硬件厂商等多方资源。例如，与社区合作开展老年人智慧健身项目；与企业合作推出员工健康计划；与保险公司合作开发基于运动数据的创新健康险产品。通过 API 接口开放数据与服务能力，吸引更多合作伙伴加入，共同围绕用户需求进行服务创新，最终形成一个多方共赢的价值网络。

结论：本研究认为，智慧体育场景下的太极拳数字化服务创新，其实质是一场深刻的范式革命，其核心是从传统的、以技术为导向的“产品供给”模式，转向以用户为中心、多方参与的“价值共创”模式。我们提出的“技术—场景—价值”三位一体整合框架，系统阐明了实现这一转型的内在逻辑与关键路径。这一转型不仅能极大提升太极拳服务的质量与体验，更能有效激活其在全民健身、主动健康、文化遗产与产业发展中的多元价值，使其在新时代焕发出更加蓬勃的生命力。

建议：（1）政府与行业协会层面，应出台专项政策，鼓励支持太极拳领域的“智慧体育”技术研发与应用示范。建立行业数据标准与服务规范，推动不同平台间的数据互联互通。将效果显著的太极拳数字化服务项目纳入政府购买公共体育服务的范围。（2）服务提供商层面，企业应转变思维，从“卖课程”“卖产品”转向“运营用户”“经营场景”。加大在个性化算法、沉浸式体验技术上的研发投入。构建开放平台战略，积极引入多方合作伙伴，共同做大生态蛋糕。（3）人才培养层面，鼓励体育院校与信息技术、设计学等专业交叉融合，培养一批既懂太极拳文化，又掌握数字化服务设计、数据分析、社群运营能力的复合型“智慧体育”人才，为产业的长远发展提供智力支持。

关键词：智慧体育；太极拳；数字化服务；价值共创；技术赋能

Research on Digital Service Innovation of Tai Chi in the Context of Smart Sports

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Abstract: In the era of deep integration between "Healthy China" and the digital economy, smart sports, characterized by data-driven, intelligent interaction, and scene integration, are profoundly reshaping the sports lifestyle and health management model of the nation. Tai Chi, as a traditional Chinese sport with multiple values including fitness, health preservation, and cultural inheritance, is undergoing a structural transformation from single "product supply" to diverse "service innovation" in its digital development. However, current digital services for Tai Chi still face development bottlenecks such as insufficient integration of technology and culture, homogenized user experience, and a single value chain. **Objective:** This study aims to construct a systematic theoretical framework for the digital service innovation of Tai Chi to drive a paradigm shift in its service model, with the expectation of providing systematic theoretical explanations and practical paths for the digital service innovation of Tai Chi. **Method:** This study mainly adopts a research method combining theoretical construction and case analysis. On the theoretical level, it systematically reviews relevant literature on smart sports, service design, value co-creation, and scene theory to construct a cross-disciplinary theoretical model with explanatory power. On the practical level, it selects representative smart sports applications (such as Keep, Peloton), digital health preservation platforms, and digital service innovation cases of Tai Chi (such as AR Tai Chi smart screens, AI motion assessment systems, etc.) at home and abroad, and conducts in-depth analysis of their technical architectures, service processes, business models, and user experiences to verify, correct, and enrich the theoretical framework proposed in this paper. **Results:** (1) Personalized and predictive services: By using AI algorithms and health data (such as heart rate, balance ability, activity patterns) and exercise data (such as movement accuracy, practice frequency) collected from wearable devices, personal digital health profiles are established for users. Based on this, AI coaches can not only provide personalized practice plans tailored to each individual but also predict health risks based on data trends and proactively push preventive and intervention Tai Chi health preservation plans. (2) Immersive and interactive experiences:

By applying VR/AR technology, users are transformed from viewers on a two-dimensional screen to participants in a three-dimensional virtual space. Users can follow Zhang Sanfeng to learn Tai Chi on the virtual peak of Wudang Mountain or receive one-on-one guidance from a virtual coach projected in their living room through AR. This immersive experience greatly enhances the fun of learning and the "presence" of the body, effectively addressing the pain point of insufficient "understanding" in traditional online teaching. (3) Multi-modal perception and intelligent feedback: By combining computer vision and multi-sensor fusion technology, smart terminals (such as smart screens, smart mirrors) can accurately capture the user's full-body skeletal points, real-time analyze the amplitude, speed, and stability of their movements, and provide immediate and precise feedback through voice, images, or even light and shadow. This enables the "posture correction" that originally relied on on-site coaching by instructors to be automated and popularized. (4) Smart communities and home health preservation scenarios: In smart communities, AR Tai Chi smart screens and outdoor smart fitness paths can serve as convenient entry points for practice. At home, smart TVs and smart speakers can be used to start Tai Chi practice mode with a single click and be linked with home health monitoring devices to form a closed-loop home health preservation service integrating "practice - monitoring - feedback - management". (5) Smart tourism and immersive experience scenarios: In tourist attractions such as the birthplace of Tai Chi, tourists can interact virtually with historical Tai Chi masters through AR navigation applications, learn a few moves, and achieve an "immersive" cultural experience. This deep integration of "sports + tourism" transforms Tai Chi from a simple fitness activity into a cultural tourism product that can be experienced and consumed. (6) Digital healthcare and proactive health scenarios: Develop evidence-based medical verified Tai Chi prescriptions (such as specific routines for Parkinson's disease and osteoporosis) into professional digital therapeutics applications and incorporate them into the medical insurance and public health service system. Under the guidance of doctors, patients can use the application for auxiliary rehabilitation training, and their practice data can be transmitted back to the medical system as a basis for clinical assessment and treatment plan adjustments. (7) Open content creation platform (UGC/PGC): Encourage and empower users (UGC) and professional coaches (PGC) to share their practice experiences, teaching videos, adapted routines, and music compositions on the platform. The platform provides user-friendly creation tools and traffic support to form a rich and diverse, continuously updated content ecosystem that meets the needs of users at different levels. (8) Community-based incentive and knowledge sharing mechanism: Build an

online and offline connected Tai Chi digital community. Through gamified designs such as points, medals, and leaderboards, encourage users to persist in practicing and sharing their achievements. Regularly organize online "cloud competitions", live Q&A sessions with experts, and offline theme exchange meetings to promote the flow of knowledge and emotional connections among community members, transforming individual practice behaviors into collective practices with social attributes. (9) Multi-stakeholder collaborative service ecosystem construction: The platform should actively connect with government agencies (such as sports bureaus and health commissions), medical institutions, health and wellness centers, cultural and tourism enterprises, hardware manufacturers, and other resources. For example, collaborate with communities to launch smart fitness projects for the elderly; partner with enterprises to introduce employee health plans; and work with insurance companies to develop innovative health insurance products based on movement data. By opening data and service capabilities through API interfaces, attract more partners to join and jointly innovate services around user needs, ultimately forming a value network that benefits all parties. **Conclusion:** This study believes that the digital service innovation of Tai Chi in the context of smart sports is essentially a profound paradigm revolution, with its core being the shift from the traditional, technology-oriented "product supply" model to a user-centered, multi-party participation "value co-creation" model. The "technology-scenario-value" trinity integration framework we propose systematically clarifies the internal logic and key paths for achieving this transformation. This transformation can not only significantly enhance the quality and experience of Tai Chi services but also effectively activate its diverse values in national fitness, proactive health, cultural inheritance, and industrial development, enabling it to thrive with greater vitality in the new era. **Recommendations:** (1) At the government and industry association level, special policies should be introduced to encourage and support the research and application demonstration of "smart sports" technologies in the Tai Chi field. Establish industry data standards and service norms to promote data interconnection among different platforms. Include effective Tai Chi digital service projects in the scope of government-purchased public sports services. (2) At the service provider level, enterprises should shift their mindset from "selling courses" and "selling products" to "operating users" and "managing scenarios". Increase investment in personalized algorithms and immersive experience technologies. Adopt an open platform strategy and actively introduce multiple partners to jointly expand the ecosystem. (3) At the talent cultivation level, encourage sports colleges to integrate with information technology, design, and other disciplines to

cultivate a group of compound "smart sports" talents who understand Tai Chi culture and possess digital service design, data analysis, and community operation capabilities, providing intellectual support for the long-term development of the industry.

Keywords: Smart sports; Tai Chi; Digital services; Value co-creation; Technology empowerment