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Date: 2023-10-08T00:00:00+00:00

Abstract

Objective: To investigate innovations and pathways in the digital development of university textbooks.

Methods: This study examines the characteristics, innovation models, and operational management of digital university textbook publishing to explore avenues for high-quality development in higher education and publishing institutions.

Results: The research proposes innovative pathways and future development trends for digital textbook construction in universities.

Conclusion: The comprehensive development of high-quality digital textbook resources and platforms oriented toward future needs and international standards is essential to achieve shared, public-welfare-oriented, equitable, and balanced development of publishing resources.

Full Text

Preamble

An Exploration of Innovation in University Digital Textbook Publishing

(People' s Posts and Telecommunications Publishing House, China Industrial and Information Technology Media Group, Beijing 100164)

Abstract

Purpose: This study explores innovations and pathways in the digital construction of university textbooks. **Method:** From the perspectives of characteristics, innovative models, and operational management of digital university textbook publishing, it examines approaches for the high-quality development of higher education and publishing institutions. **Results:** The paper proposes innovative pathways and development trends for university digital textbook construction. **Conclusion:** It advocates comprehensively building high-quality digital textbook resources and platforms oriented toward the future and internationalization, thereby achieving sharing, public welfare, equity, and balanced development of publishing resources.

Keywords: university textbooks; digital content; digital publishing; innovation; informatization

CLC Number: G632 **Document Code:** A **Article ID:** 1671-0134(2023)03-131-04 **DOI:** 10.19483/j.cnki.11.4653/n.2023.03.029 **Citation Format:** CUI Wei. An Exploration of Innovation in University Digital Textbook Publishing[J]. China Media Technology, 2023(03): 131-134.

Driven by information technology, big data, and artificial intelligence, the channels and methods of knowledge dissemination have undergone tremendous transformation. Currently, digital textbook publishing, carried by informatization, has become the new normal in the publishing industry. In 2018, the Ministry of Education issued the *Education Informatization 2.0 Action Plan*, which calls for building an education informatization system compatible with national economic, social, and educational development levels to support and lead the modernization of education, thereby forming new educational forms, models, and business models for the new era. Against this backdrop, university textbook authors and publishing editors must master digital tools for book publishing, particularly familiarizing themselves early on with the various changes brought about by digital technologies to teaching models, publishing methods, and readers' reading habits.

Under the new-era digital textbook publishing model, authoring, editorial processing and proofreading, and publication distribution can all work collaboratively, effectively streamlining workflows, improving quality, reducing costs, and enhancing teaching and learning efficiency for instructors and users. This collaborative approach enables textbook development team members to share information in real time, track writing progress anytime and anywhere, and coordinate on specific tasks such as framework structure, chapter division, language style, presentation format, and material preparation. Furthermore, through questionnaire surveys and platform feedback, they can promptly understand reader demands, thereby improving the practicality and applicability of textbooks. Publishing institutions, via real-time collaborative online editorial systems, can promptly identify and correct common writing and editorial issues, ensuring quality control at the source of textbook writing and digital publish-

ing, strictly adhering to publishing standards, reducing workload in subsequent proofreading stages, lowering costs, and improving publishing efficiency and quality.

The collaborative nature of digital textbook publishing also manifests in the need to consider value-added services, application scenarios for audio-visual content, and continuous testing and iteration throughout the early, middle, and late development stages to enhance user experience and ensure publishing quality. This paper focuses on analyzing the characteristics of digital textbook publishing, identifies the practical impacts of university textbook digitalization on higher education teaching and publishing institutions, and attempts to propose innovative methods for university textbook publishing in the digital context, providing references to promote the digital development of university textbooks.

1. Characteristics of Digital Textbook Publishing

Digital textbooks represent a new form of digital publishing that integrates multiple digital publishing services, including print books, images, e-books, teaching courseware, instructional audio-video content, online exercises and tutoring, and online examinations and certification. Leveraging the convenience and ubiquity of digital information technology, university textbook authors, editors, publishers, and learners can all achieve effective writing, editorial proofreading, and learning outcomes online, thereby improving efficiency and enhancing knowledge acquisition. Digital textbook publishing exhibits the following characteristics.

1.1 Multi-User Collaborative and Efficient Work Platform

University textbooks demand high standards in academic rigor, cutting-edge content, and seriousness. They are typically created collectively by expert scholars from Ministry of Education teaching guidance committees or from key disciplines at prestigious universities, making efficient collaboration essential for quality textbook publishing. With the rapid proliferation of information technology and accumulated teaching practice, premium courses and textbooks from renowned institutions, famous teachers, and notable authors have gained widespread popularity, leading to increased investment in high-quality resources and a noticeable head-effect. The consensus on course refinement and vertical specialization has become an important means for improving educational quality, efficiency, and balanced, inclusive development. Moreover, the increasingly frequent integration and crossover between online and offline environments, along with more diverse and colorful application scenarios, present new challenges for authors and publishing institutions. Therefore, comprehensive consideration is required in textbook development, author team building, and platform selection. User forwarding volume, online learning time and costs, effectiveness evaluation, problem discussions, and emotional resonance remain key factors in digital textbook operations, all requiring collaborative efforts from authors, publishing institutions, and other stakeholders.

1.2 Copyright, Processing, and Storage Methods Based on Big Data and Cloud Computing

Copyright forms the foundation of digital textbook construction. Digital textbooks generally involve interdisciplinary and related fields, and can utilize big data technologies such as "knowledge graphs"to achieve information visualization and discover connections between sub-disciplines and knowledge points. Therefore, during the textbook planning and topic selection stage, publishing editors must communicate thoroughly with authors and audio-visual production agencies about resource acquisition scope, rights, formats, and forms. They must ensure clear copyright chains and authorization contracts at the source, providing a solid basis for authors to exercise their creativity and produce high-quality textbook content.

Digital textbooks are typically produced using word processing software and audio-video editing tools for text layout and multimedia editing. Throughout the publishing process, publishing houses must first strictly control textbook quality, adhering to the fundamental principle of "mandatory review for all compilations," embodying the educational philosophy of fostering virtue and cultivating talent. They must meet four quality requirements for digital textbooks: effectiveness (all components can open and function properly), integrity (all essential elements and information for a publication are present), standardization (compliance with relevant technical specifications and national standards), and accuracy (editing errors within nationally permitted ranges). Beyond these basics, publishers must also consider how text, images, audio, and video are presented across different terminal devices, as well as the application scenarios and audience habits of digital textbooks, ensuring greater flexibility and convenience in user interactivity.

During digital textbook publishing, content review security, data security, and storage security have become critical aspects of risk management. Publishing institutions generally adopt leading domestic cloud storage solutions such as Alibaba Cloud and Tencent Cloud. Publishers should leverage big data and information technology to ensure secure content review, storage, and usage, employing cybersecurity tools to effectively block hacking attacks or web scraping for piracy. In terms of link management, they must ensure that servers linking to digital content remain within controllable and manageable scopes, preventing situations where links become inaccessible or display illegal content due to server expiration. Regarding data bandwidth, publishers must adequately estimate textbook usage in terms of user numbers, time periods, and speed requirements.

1.3 Mass Accessibility, Multi-Terminal, Multi-Scenario, and Interactivity

Digital textbook platforms should meet conditions of mass accessibility, shareability, interactivity, popularization, and low barriers, enabling registered users

to create, view, listen, and learn online anytime, thereby breaking through limitations of time, space, social class, and educational resources. This achieves a closed-loop service process from creation to dissemination to effectiveness feedback for textbooks and courses. Digital textbooks must satisfy multi-terminal and multi-scenario requirements. For instance, on lightweight mobile devices such as smartphones, tablets, and portable projectors, digital textbook content should be easily presented and capable of meeting differentiated needs across various scenarios like classroom instruction and self-study.

The interactivity of digital textbooks also constitutes an important component of knowledge services, effectively enhancing user stickiness and core competitiveness. Interactivity is mainly manifested in three aspects: First, through search engines and intelligent recommendation systems on university textbook publishing platforms, employing upward-shifting association mechanisms to reshape knowledge correlation methods, supplementing users' active searches with associated content presentations to guide them toward browsing high-quality digital textbook resources. Second, building expert systems and teaching assistant systems for textbook publishing to provide intelligent consulting services on textbook resources for university faculty and students, answering questions and collecting feedback, which can both reduce platform maintenance investment and enhance users' sense of gain. Third, utilizing content recommendation algorithm tools combined with progressive and iterative textbook development to expand the influence of discipline-specific textbook series, enabling timely revision and recompilation through multi-dimensional user data analysis and real-time feedback to ensure textbook quality and improve user reputation.

1.4 Multi-Platform, Multi-Terminal Distribution Channels and Payment Methods

Digital textbook distribution channels generally leverage established online education institutions such as "XuetangX" and "iCourse," as well as well-known internet platforms like NetEase and Bilibili, and self-operated networks of various publishing institutions. These platforms must fully utilize big data technology and algorithmic recommendation functions to accurately identify user attributes, assess user needs, and precisely pinpoint selling points of digital textbooks, thereby enhancing the precision of knowledge service marketing and increasing digital textbook circulation.

Digital textbook distribution channels must be adapted to application scenarios. Mobile internet has resolved previous time and space constraints on accessing various courses, enabling readers to obtain audio-video content anytime and anywhere via mobile apps, significantly improving learning convenience and efficiency. This achieves integrated comprehensive learning effects combining "textbook + audio + video + online exercises and Q&A + practical training + certification."The convenience, stability, and response speed of network platform access are also decisive factors in evaluating digital textbook quality and have become key concerns in digital textbook production.

In the dissemination phase of digital textbooks, relying on resources from various platforms including authors, universities, academic research institutions, and publishing houses, and fully utilizing big data and artificial intelligence technologies, promotional efforts should be extensively conducted through new media channels such as relevant client applications, Weibo, WeChat, Toutiao, and Douyin. Authors and publishing institutions must promptly track data on user profiles, traffic duration, usage periods, and geographic distribution across these platforms, thereby opening feedback channels through reader communities and daily communication mechanisms to achieve efficient and precise marketing. Digital textbook online payment emphasizes convenience and security, requiring support for convenient payment tools such as Alipay and WeChat Pay, while ensuring that accounts match both in records and in reality, accurately reflecting digital textbook sales data and operational conditions.

2. Three Innovative Models of Digital Textbook Publishing

The digital transformation of textbooks has given rise to several distinct innovative models that leverage technology to enhance educational content and delivery.

2.1 Digital Product Development Based on Traditional Print Textbooks

A common form of digital textbook is the micro-lecture version, which uses QR codes to expand the physical carrying space of traditional print textbooks, extending professional knowledge and practical case materials to create new-type textbooks with cloud-based knowledge services. Such micro-lecture textbooks are particularly common in vocational colleges and application-oriented undergraduate programs, enabling real-time fragmented video teaching based on traditional textbooks. Key knowledge point videos, extended content, and all appendices are placed in the book as QR code links, intersecting and integrating physical and digital spaces to make narratives clearer and content richer, highlighting the novelty and practicality of this new textbook form. This makes reading and using textbooks more convenient for readers, improving learning efficiency and effectiveness.

2.2 Building University Digital Textbook Publishing Resource Libraries with Quality Educational Resources

The Ministry of Education has constructed national-level premium course online education platforms at the state level, such as the National Higher Education Smart Education Platform officially launched at the end of March 2022. The construction of its course teaching resources relies on development by high-education-level regions, high-quality schools, high-caliber teachers, and high-production-level teams, with each lesson undergoing instructional design, lesson preparation research, courseware creation, and repeated refinement. Other re-

sources also adhere to extensive selection, choosing the best from the good, and connecting wherever possible to ensure resources are premium, professional, and systematic. Various provinces, autonomous regions, and municipalities have also built their own provincial premium teaching resource sharing platforms, such as the Zhejiang Province Higher Education Online Open Course Sharing Platform and the Chongqing Higher Education Online Open Course Platform, which integrate high-quality course resources from their respective regions.

Digital textbook publishing institutions should fully utilize these premium course resources to build digital textbooks and supporting digital resource libraries, forming "textbook publishing resource packages" that include teaching courses, instructional plans, textbook supplementary materials, images, audio-video content, teaching animations, practical training platforms, online test question banks, and other digital resources. This not only frees instructors from repetitive teaching tasks but also enables students to learn seamlessly anytime and anywhere, greatly improving teaching efficiency and effectiveness, and better addressing the issue of cooperative sharing of premium resources among universities and teachers. Some universities provide incentives for outstanding teachers' investment in digital textbook compilation by counting it toward teaching hours and providing research funding support.

2.3 Humanized and Immersive Learning "Golden Course"Digital Textbook Publishing Model

With the rapid advancement of informatization and intelligent technologies, along with continuous development in online education concepts, thinking, and teaching practices, immersive learning has emerged as a new form of digital teaching in higher education. This is an online teaching activity centered on the "digital classroom" that can make teachers and students feel as if they are in a physical classroom.

At this point, digital textbook publishing services transform into knowledge services that meet diverse scenario-based needs, extending digital teaching activities from the classroom to before and after class, shifting from knowledge transmission in offline classrooms to knowledge services available anytime and anywhere. First, by optimizing textbook network classification indexes and functional systems, personalized customized service solutions can be provided for university teachers and students. Second, various intelligent terminals and digital textbook resources can be developed for different temporal and spatial application scenarios. Third, digital and converged media knowledge service platforms serving both teaching and learning can be built to provide users with free or paid knowledge services.

In current publishing practices, universities or publishing institutions generally focus on "large-scale online course" style teaching in building immersive learning digital textbooks, forming online "golden courses" based on digital textbooks and teaching resource libraries. "Golden courses" feature advanced, innovative,

interactive, inquiry-based, and personalized teaching characteristics. In such immersive scenarios with scientific interaction and virtual environments, interactive learning can make teaching and learning more dynamic, motivated, and vibrant for both teachers and students.

3. Operations Management of University Digital Textbook Publishing

University digital textbook publishing is closely connected to teachers, students, digital platforms, and publishing institutions, unearthing and monetizing the previously hidden educational and knowledge value deposited in the traditional book industry, becoming an important business and service model for publishing institutions. Therefore, by seamlessly grafting digital knowledge services onto user knowledge needs, publishing institutions can create a university textbook knowledge service platform that provides one-stop solutions for content product planning, editing, production, and operations. This will bring about changes in organizational structure and personnel composition, with new forces in internet technology, audio-video processing, and new media production and promotion becoming important components of publishing institutions.

3.2 Building Collaborative Information Systems

University digital textbooks possess attributes of knowledge, academia, and education, requiring publishing institutions to pursue not only economic benefits but also social benefits. In operations management, the editing, printing, and distribution of digital textbooks can reduce repetitive labor, save time and human resources, and improve business efficiency. Publishing digital textbooks or adopting digital-first publishing before print can effectively reduce traditional printing costs. Additionally, real-time user data enables precise print run management, reducing waste and saving warehouse and logistics costs. Publishers can also determine the most suitable content carrier forms and dissemination platforms based on content characteristics, maximizing joint deep operations with major digital education publishing platforms. Achieving one-time production with multi-terminal release, with interconnectivity between different devices and platforms, creates synergistic effects from digital textbook sharing services and realizes high-quality development in digital publishing.

3.3 Building an Operations Management System Centered on Digital Copyright as Core Assets

From the perspective of copyright operations management, the relationship between authors, publishing institutions, and teaching service platforms is one of copyright licensors and licensees. Relatively speaking, textbook authors are scattered across the

Note: Figure translations are in progress. See original paper for figures.