Diversitas Journal
ISSN 2525-5215
Volume 9, Issue 3 (Jul./Sep. 2024) p. 1564 – 1579
https://diversitasjournal.com.br/diversitas_journal

Higher Education Institutions' appreciation and adoption of e-publishing in Macau, China

YI, Ye [1]; BALAZON, Francis G. [2]

[1] 0009-0004-7947-1960; College of Teacher Education Graduate School, Batangas State University The National Engineering University, Philippines, 747ye@sina.com
[2] 0000-0003-0143-2983; College of Teacher Education Graduate School and College of Informatics and Computing Sciences Lipa Campus, Batangas State University The National Engineering University, Philippines, francis.balazon@g.batstate-u.edu.ph

ABSTRACT

The rapid digitization of scholarly communication has globally transformed the landscape of academic publishing. Through descriptive research, this study explored the appreciation and adoption of e-publishing strategies within higher education institutions in Macau, China. It aimed to establish a framework for effective e-publishing strategies in educational management to enhance teaching methodologies, student engagement, and learning outcomes. The research objectives included profiling higher education institutions based on enrollment figures, teaching modalities, institutional types, and learning facilities. Additionally, it assessed the level of appreciation of administrators, teachers, and students regarding electronically published learning materials in terms of quality, content, accessibility, and cost-effectiveness. Comparative analyses were conducted to discern differences in assessments among the three respondent groups. Furthermore, the study examined the relationship between institutional profiles and the level of appreciation for e-publishing. It also evaluated the extent of e-publishing adoption in academic management, administration, resource accessibility, and learning outcomes. There is a moderate level of adoption of electronically published learning materials in terms of academic management, administration, and learning outcomes as assessed by administrators, teachers, and students. Ultimately, the findings led to the development of a strategic plan to promote the effective integration of e-publishing in higher education institutions in Macau, China.

ARTICLE INFORMATION

Article process:
Submitted: 07/10/2024
Approved: 09/03/2024
Published: 09/07/2024

Keywords:
e-Publishing,
higher education institution,
digital transformation,
educational technology,
learning outcomes

RESUMO

A rápida digitalização da comunicação acadêmica transformou globalmente o cenário da publicação acadêmica. Através de uma pesquisa descritiva, este estudo explorou a apreciação e adoção de estratégias de publicação eletrônica nas instituições de ensino superior em Macau, China. O objetivo foi estabelecer um framework para estratégias eficazes de publicação eletrônica na gestão educacional, visando aprimorar as metodologias de ensino, o engajamento dos estudantes e os resultados de aprendizagem. Os objetivos da pesquisa incluíram a elaboração de perfis das instituições de ensino superior com base nos números de matrículas, modalidades de ensino, tipos institucionais e instalações educacionais. Além disso, avaliou-se o nível de apreciação de administradores, professores e estudantes em relação aos materiais de aprendizagem publicados eletronicamente em termos de qualidade, conteúdo, acessibilidade e custo-benefício. Foram realizadas análises comparativas para discernir as diferenças nas avaliações entre os três grupos de respondentes. Ademais, o estudo examinou a relação entre os perfis institucionais e o nível de apreciação da publicação eletrônica. Também foi avaliado o grau de adoção da publicação eletrônica na gestão acadêmica, administração, acessibilidade aos recursos e resultados de aprendizagem. Há um nível moderado de adoção de materiais de aprendizagem publicados eletronicamente em termos de gestão acadêmica, administração e resultados de aprendizagem, conforme avaliado por administradores, professores e estudantes. Finalmente, os achados levaram ao desenvolvimento de um plano estratégico para promover a integração eficaz da publicação eletrônica nas instituições de ensino superior em Macau, China.

Keywords:
Publicação eletrônica,
instituição de ensino superior,
transformação digital,
tecnologia educacional,
resultado de aprendizagem

DOI: 10.48017/dj.v9i3.3095

Introduction

Nowadays, human society has entered the digital age. Big data, cloud computing, 5G, artificial intelligence, and other digital information technologies have brought about tremendous changes to the publishing industry, with e-publishing emerging as a new growth area. The application of e-publishing in the field of education has undergone significant transformations over the past few decades.

The history of e-publishing in educational institutions can be traced back to the late 20th century and the early 21st century. Forward-thinking educational institutions started digitizing textbooks and learning resources for computer-based use in the 1990s. However, due to limitations in technological capabilities and the lack of widespread digital devices, these endeavors were relatively limited.

As the internet became more prevalent and technology continued to advance, educational institutions in the early 2000s began to recognize the potential of e-publishing. Digital textbooks, online learning platforms, and electronic books became key terms in the field of education. Schools and universities started establishing online learning systems, providing remote education and online resources. In the mid to late 2000s, the widespread adoption of mobile devices further propelled the application of e-publishing in educational institutions. Educational applications, e-learning platforms, and personalized learning tools began to emerge, offering students and teachers more flexible and convenient learning methods.

Currently, e-publishing is indispensable in educational institutions. Schools and universities widely adopt digital textbooks, online learning platforms, and electronic resources, offering students a more flexible and convenient learning experience. Educational institutions leverage e-publishing to promote distance education and support online and blended learning models. Students can access knowledge through electronic books, multimedia materials, and interactive learning tools, while teachers can more effectively manage and share educational content (He Ye, 2016). The current state of e-publishing in educational institutions is characterized by the widespread application of digital learning resources, providing students and teachers with more choices and richer learning experiences.

In the digital era, e-publishing is poised to shape a more innovative and flexible future for educational institutions. Advanced technologies will profoundly alter the learning experience to meet the diverse needs of students. Simultaneously, global connectivity will drive the cross-border application of digital textbooks and online learning platforms, fostering international collaboration in education. Students will increasingly access knowledge through mobile devices, prompting educational institutions to design more interactive and social learning tools. Overall, future e-publishing is set to lead education into an era characterized by greater innovation, globalization, and personalization. The transition from traditional publishing to e-publishing represents a profound transformation involving multifaceted

developments. Firstly, digitization of content stands as a pivotal step, wherein publishers convert printed material into digital formats suitable for electronic devices, and the widespread adoption of e-book readers, smartphones, and tablets has provided convenient tools for digital reading.

According to the "Education Informatization 2.0 Action Plan" policy issued by the Ministry of Education in April 2018, China aims to "construct digitalized campuses and enhance the level of information application among teachers and students." The integration of digital technology with educational institutions lays the foundation for more efficient student learning. Traditional paper-based teaching materials are no longer sufficient to meet the needs of this policy, prompting educational institutions to innovate traditional publishing models. The goal is to integrate high-quality educational content with electronic publishing, creating entirely new scenarios for the application of educational informatization.

Based on the researchers' observations of the education industry, driven by the wave of digitization, educational institutions have embarked on innovative explorations of publishing models. Many educational institutions have successfully utilized electronic publishing to adapt to this transformation. According to Li Xiaoman, educational institutions in China are continuously exploring innovations in publishing models. Researchers identify three aspects of educational institutions' exploration of e-publishing: exploring the "Internet + education publishing" model, establishing digital platforms, and developing online education models (Li Xiaoman, 2021).

Through the exploration of the "Internet + education publishing" model, educational institutions integrate digital technology with instructional courses to develop digital teaching resources, gradually optimizing the presentation of educational content. For example, incorporating audio and video resources into textbooks enhances the dynamism of classroom teaching, guiding students to cultivate good study habits to improve learning efficiency.

In the construction of digital platforms, educational institutions leverage their faculty advantages to develop high-quality digital resources such as courseware, lesson plans, audio-visual materials, and question banks on the platform. Users can access these resources through IP addresses, accounts, and other means, achieving a mutually beneficial cooperation between schools and educational institutions.

Regarding the development of online education models, taking MOOCs as an example, its primary form is video-recorded lectures. Through online education digital platforms, students can achieve remote self-directed learning. Online education facilitates the sharing of high-quality educational resources, addressing, to some extent, the issue of uneven distribution of teaching resources.

In recent years, these models and platforms have experienced rapid development with significant outcomes. However, they also face challenges such as insufficient assignment management, subpar learning outcomes, and inadequate teacher-student interaction within

the platforms. Continuous innovation is needed in aspects like course presentation, integration of educational resources, and digital technology support to address these issues.

Technologically, some electronic publications lack in-depth development. As per the requirements of Education Informatization 2.0, the digitization of educational content cannot merely involve surface-level transformation; instead, it necessitates integration and restructuring to create content conducive to electronic publishing, forging a comprehensive curriculum framework. Currently, most digital innovations in educational institutions remain at the surface level, merely converting the format of traditional content into electronic publications, rather than substantially innovating.

Although electronic publications do enhance the dissemination efficiency compared to traditional materials, they have not effectively improved students' learning methods, falling short of a genuine transformation. In online education, while resources in electronic publications are more refined and diverse in presentation, they struggle to meet personalized learning demands. Courses on electronic publishing platforms mainly entail traditional teacher-led instruction, where online learners passively consume content through videos without active interaction or conducive learning environments, resulting in lower efficacy. Enhancing learning experiences and providing precise personalized services stand as pivotal facets for educational institutions adopting innovative electronic publishing models.

Secondly, there is difficulty in transforming the strengths of traditional publications' content. Educational institutions boast rich accumulated educational resources, yet to keep pace with the zeitgeist and ensure sustainable development, they must convert these resources into digital formats. However, most high-quality traditional resources cannot swiftly transition into electronic publications. Moreover, innovating in electronic publishing is not merely converting paper content; it involves resource reconstruction and curriculum development, ensuring the transmission of critical knowledge through appropriate means. Many institutions lack individuals adept in both advanced electronic publishing technology and pedagogical expertise, causing gaps in their technological and educational integration. Strengthening the cultivation and recruitment of multidisciplinary talents becomes imperative for educational institutions to genuinely drive innovation and development.

Financially, for the majority of educational institutions, the introduction of electronic resources or the establishment of an electronic publishing platform is not their core business. Moreover, it requires significant costs, not only in terms of initial investment but also due to a long return-on-investment period. When promoting their platforms, collaboration with other channels is necessary, adding to the complexity. Therefore, educational institutions not only need to consider the initial investment in digital transformation but also must address the uncertainty of long-term returns. In addition, platform promotion involves cooperation with various parties, increasing the financial costs of coordination. Against this backdrop, it becomes crucial to formulate prudent financial plans and seek sustainable funding support.

Educational institutions can mitigate financial risks by expanding partnerships, exploring innovative financing avenues, and accurately assessing investment returns. A comprehensive understanding of the financial impact of digital transformation, coupled with flexible responses, will help ensure the sustainable success of educational institutions in the field of electronic publishing.

Culturally, due to economic and social constraints, the pace of information technology development in domestic educational institutions is relatively slow. Moreover, the domestic public has insufficient awareness and confidence in electronic publishing, significantly impeding the adoption of electronic publications by educational institutions. The low societal acceptance is a major hindrance, leading to a scarcity of online educational resources in certain countries. Educational institutions hindered by this lack of societal acceptance struggle to access an adequate pool of information resources within a robust educational network. This challenge stands as a significant obstacle to the development of electronic publishing for educational institutions.

It is for these reasons that the study was conducted. First, in the implementation of electronic publishing within educational institutions, numerous challenges have emerged, each concealing opportunity within. This necessitates researchers to conduct more in-depth investigations and understanding. Second, researchers have shown a widespread interest in electronic publishing within educational institutions in the digital era.

Lastly, delving into this field through extensive research will bring forth new insights and solutions for both academia and practical applications. Previous studies have identified limitations in the transformation of electronic publishing in the education industry during the digital age; thus, further research can address these gaps or provide new perspectives. The objective of this study is to profoundly unveil an effective framework for electronic publishing strategies in educational management, aiming to enhance teaching methodologies, elevate student engagement, and comprehensively optimize learning outcomes. Through systematic research and a meticulously designed framework, the goal is to pursue innovation in technological practices and seek reform at the strategic level of educational management.

Research method and procedure

Research Design

This study employed a descriptive-correlational research design, which is a non-experimental research method used to describe characteristics of a population or phenomenon and to identify relationships between variables without manipulating them. The descriptive aspect of the design was used to systematically observe and describe the level of appreciation and adoption of electronically published learning materials among higher education

institutions in Macau, China. The correlational aspect aimed to examine the relationships between institutional profiles (such as enrollment figures, teaching modalities, and institutional types) and the level of appreciation and adoption of e-publishing.

According to Creswell (2014), a descriptive-correlational design is appropriate for studies seeking to describe the status of variables and explore the relationships between them. This method allows researchers to gather quantifiable information from large populations and draw inferences about the population, making it suitable for the objectives of this study.

By employing this design, the study was able to assess the extent of e-publishing adoption in various domains, including academic management, administration, resource accessibility, and learning outcomes, and to understand how these are related to institutional characteristics.

Subjects of the Study

The subjects of this study were students, teachers, and administrators from higher education institutions in Macau, China during the 2021-2022 academic year. These three groups were carefully selected based on their critical roles in the educational process and their direct interaction with electronically published learning materials. Students, as the primary beneficiaries of educational content, provide essential insights into the effectiveness, accessibility, and overall impact of these materials on their learning outcomes and engagement. Teachers, who facilitate learning and utilize these materials in their teaching practices, offer valuable perspectives on the practicality, quality, and adaptability of electronically published resources in various educational settings. Additionally, administrators, who are responsible for decision-making and the implementation of institutional policies, contribute crucial viewpoints on the strategic and administrative aspects of e-publishing adoption, including resource allocation, infrastructure development, and long-term sustainability.

By selecting these three groups, the study aimed to capture a comprehensive view of the appreciation and adoption of electronically published learning materials from the perspectives of all key stakeholders involved in the educational process. This approach ensures that the findings reflect the diverse experiences and assessments across different roles within educational institutions.

Data Gathering Instrument

The instrument used for data collection in this study was a comprehensive survey questionnaire designed to capture a wide range of information relevant to electronic publishing in educational settings. The questionnaire was developed based on an extensive review of the literature and existing questionnaires from similar studies on the adoption and appreciation of e-publishing in educational institutions. This process ensured that the instrument was

grounded in established research methodologies and covered the key variables relevant to the study's objectives.

A well-known study that informed the development of this questionnaire is the research conducted by Davis (1989) on the Technology Acceptance Model (TAM), which has been widely used to measure users' acceptance and adoption of various technologies. The principles of TAM, particularly its focus on perceived ease of use and perceived usefulness, were adapted to the context of e-publishing in higher education. The questionnaire also drew from similar studies that assessed the adoption of educational technologies, ensuring that the instrument was both valid and reliable.

By aligning the questionnaire with established models and circulating studies, the instrument was designed to accurately measure the level of appreciation and adoption of electronically published learning materials among the study's subjects. This approach also helped avoid the need for exploratory factor analysis, as the instrument's constructs were already validated through previous research.

Questionnaire Construction and Validation

The construction of the questionnaire was guided by the research objectives and a thorough literature review. The instrument consisted of structured questions designed to address the profile of higher education institutions, the level of appreciation for electronically published learning materials, and the extent of their adoption. To ensure the validity and reliability of the instrument, the study underwent a rigorous validation process that included both exploratory factor analysis (EFA) and reliability testing.

First, an exploratory factor analysis (EFA) was conducted to identify the underlying constructs of the study. Prior to the EFA, the Bartlett's Test of Sphericity and the Kaiser-Meyer-Olkin (KMO) measure were performed to determine the adequacy of the sample data for factor analysis. The Bartlett's Test yielded a significant result, indicating that the correlations between items were sufficiently large for EFA. The KMO measure of sampling adequacy was above the recommended threshold of 0.6, confirming that the data were appropriate for factor analysis.

Upon confirming the suitability of the data, the EFA was performed to explore the factor structure of the questionnaire items. This analysis helped to identify and confirm the distinct constructs that the instrument was designed to measure. The factors were extracted using principal component analysis with varimax rotation, ensuring that the items loaded significantly onto their respective constructs.

Following the factor analysis, reliability testing was conducted using Cronbach’s alpha and McDonald's omega to assess the internal consistency of the constructs identified by the EFA. Both reliability measures indicated that the constructs had high internal consistency,

with Cronbach's alpha values exceeding the generally accepted threshold of 0.7 and McDonald's omega values providing further support for the reliability of the scales.

These steps ensured that the questionnaire was both valid and reliable, providing a sound basis for the data collection and subsequent analysis in this study.

Administration and Scoring of Responses

The finalized questionnaire was administered electronically to maximize convenience and response rates. This method allowed for wide-reaching distribution across the selected educational institutions in Macau. Respondents were informed about the purpose of the study, assured of their anonymity and confidentiality, and given clear instructions on how to complete the questionnaire. Responses were quantitatively analyzed, with numerical values assigned to each response option for Likert-scale questions, allowing for the calculation of mean scores and the analysis of patterns and trends. Open-ended responses were analyzed qualitatively to extract themes and insights that complemented the quantitative data. This combination provided a holistic understanding of the perspectives on electronic publishing in educational settings.

Data Gathering Procedure

Upon approval for the conduct of the study, letters of request were submitted to the administrators of the ten higher education institutions in Macau, China, seeking permission to gather data. Using the researcher-made questionnaire, data were collected electronically through Jinshan Forms. This approach ensured wide-reaching dissemination and convenience for administrators, teachers, and students. Participants were informed about the study's purpose, assured of their anonymity and confidentiality, and provided with clear instructions on how to complete the questionnaire. Responses were securely stored, with personal identifiers removed to protect participants' identities. The collected data were prepared for analysis, with both quantitative and qualitative responses systematically organized.

Statistical Treatment of Data

The data gathered from the questionnaires were subjected to various statistical methods to ensure a comprehensive analysis and interpretation, tailored to the specific objectives of the study.

1. Weighted Mean. This statistical process was employed to analyze the responses to Likert-scale questions related to the level of appreciation and adoption of electronically published learning materials. The weighted mean provided an overall score for each item, allowing for the interpretation of respondents' assessments across different categories such as quality, content, accessibility, and cost-effectiveness.

2. Percentage and Frequency. These were used to describe the demographic characteristics of the respondents and the profile of the higher education institutions involved in the study. Percentages and frequencies helped in understanding the distribution of various characteristics, such as the number of enrollees, types of institutions, and teaching modalities.
3. T-test. The t-test was applied to compare the means of different groups, particularly when assessing differences in the level of appreciation between students, teachers, and administrators. This test helped to identify whether there were significant differences in perceptions or experiences between these distinct respondent groups.
4. F-test (ANOVA). Analysis of variance (ANOVA) was used to compare the means of more than two groups, especially when analyzing the variability in the extent of e-publishing adoption across different institutional profiles. The ANOVA was crucial in determining whether factors such as the number of enrollees or the type of institution had a significant influence on the adoption levels of e-publishing.
5. Exploratory Factor Analysis (EFA). EFA was employed to determine the underlying constructs measured by the questionnaire items. This process involved Bartlett's Test of Sphericity and the Kaiser-Meyer-Olkin (KMO) measure to ensure data suitability, followed by factor extraction using principal component analysis with varimax rotation.
6. Reliability Testing. Cronbach's alpha and McDonald's omega were used to assess the internal consistency of the constructs identified through EFA. These reliability measures ensured that the scales used in the questionnaire were consistent and reliable.

Results and discussions

Profile of Higher Education Institutions

The study assessed various profiles of higher education institutions in Macau, China, including the number of enrollees, teaching modalities, types of institutions, and teaching and learning facilities. As illustrated in Table 1, 70% of the institutions have less than 5000 enrollees, while 30% have 5000 or more. The predominant teaching modality is blended learning (60%), followed by traditional classroom-based and distance learning modalities (each 40%). Most institutions are universities (60%), followed by colleges (30%) and vocational/technical schools (10%). Additionally, all institutions have libraries with physical books, 90% have digital libraries, 60% have multimedia lecture halls, and 50% have computer labs.

Table 1.

Profile of Higher Education Institutions

Profile	Frequency
Number of enrollees	70% < 5000, 30% >= 5000
Teaching modalities	60% blended, 40% traditional/distance
Type of institution	60% universities, 30% colleges, 10% vocational/technical
Teaching and learning facilities	100% physical libraries, 90% digital libraries, 60% multimedia lecture halls, 50% computer labs

Evaluation of E-Published Learning Materials

The evaluation of electronically published learning materials covered quality, content, accessibility, and cost-effectiveness. Each category was assessed by administrators, teachers, and students.

Table 2.

Quality of Electronically Published Learning Materials

Group	Quality Composite Mean
Administrators	2.52
Teachers	2.56
Students	2.53

Quality Table 2 indicates that the quality of electronically published learning materials is moderately appreciated by all groups, with composite means of 2.52 (administrators), 2.56 (teachers), and 2.53 (students). The highest appreciation was for the relevance and up-to-date nature of the information provided.

Content As shown in Table 3, the content of electronically published learning materials is also moderately appreciated. The composite means were 2.50 for administrators, 2.51 for teachers, and 2.51 for students. Regular updates to include the latest research and developments were highly valued.

Table 3.

Content of Electronically Published Learning Materials

Group	Content Composite Mean
Administrators	2.50
Teachers	2.51
Students	2.51

Accessibility Table 4 presents the accessibility ratings, which are moderately appreciated across all groups. Composite means were 2.54 for administrators, 2.58 for teachers, and 2.62 for students. The institutions' infrastructure supporting electronic resources was particularly well-regarded.

Table 4.

Accessibility of Electronically Published Learning Materials

Group	Accessibility Composite Mean
Administrators	2.54
Teachers	2.58
Students	2.62

Cost-Effectiveness Table 5 shows the appreciation levels for cost-effectiveness, which were low to moderate. Composite means were 2.48 for administrators, 2.52 for teachers, and 2.49 for students. While teachers found the long-term benefits to outweigh initial costs, administrators and students saw cost-effectiveness as less favorable.

Table 5.

Cost-Effectiveness of Electronically Published Learning Materials

Group	Cost-Effectiveness Composite Mean
Administrators	2.48
Teachers	2.52
Students	2.49

Extent of Adoption of Electronically Published Materials

The extent of adoption of electronically published materials was assessed in terms of academic management, administration, resource accessibility, and learning outcomes.

Academic Management As shown in Table 6, the adoption of electronically published materials in academic management is moderate, with composite means of 2.58 for both administrators and teachers, and 2.57 for students.

Administration Table 6 also indicates that the adoption in administration is moderate, with composite means of 2.51 for administrators, 2.50 for teachers, and 2.50 for students.

Resource Accessibility Adoption levels in resource accessibility are moderate, as depicted in Table 6, with composite means of 2.49 for administrators, 2.51 for teachers, and 2.54 for students.

Learning Outcomes Finally, Table 6 shows that the adoption of electronically published materials in supporting learning outcomes is moderate, with composite means of 2.55 for administrators, 2.57 for teachers, and 2.57 for students.

Table 6.

Extent of Adoption of Electronically Published Materials

Domain	Administrators
Academic Management	2.58
Administration	2.51
Resource Accessibility	2.49
Learning Outcomes	2.55

Comparative Analysis and Relationships

There were no significant differences in the assessments of administrators, teachers, and students regarding the quality, content, accessibility, and cost-effectiveness of electronically published materials. Additionally, the profile of the institutions (e.g., number of enrollees, teaching modalities) does not significantly influence appreciation levels.

Discussion

The results of this study reveal a generally moderate level of appreciation and adoption of electronically published learning materials among higher education institutions in Macau, China. This finding aligns with existing literature that highlights the gradual yet cautious integration of digital resources in educational settings (e.g., Bates, 2019; Junco & Clem, 2015). While the moderate appreciation indicates a positive trend towards the acceptance of e-publishing, it also underscores the need for further development and refinement in several key areas.

Firstly, the moderate levels of appreciation suggest that while institutions recognize the potential benefits of electronically published materials, these benefits are not yet fully realized. This could be attributed to inconsistencies in quality standards across different e-publishing platforms. As noted by Nguyen (2020), maintaining high-quality standards in digital educational resources is critical for ensuring their effectiveness and acceptance among educators and students alike. Therefore, it is essential for institutions to establish clear guidelines and quality benchmarks for e-publishing to ensure that all materials meet the required standards of accuracy, relevance, and usability.

Secondly, the study highlights the need for enhanced cost-effectiveness in the adoption of e-publishing. The moderate adoption rates suggest that financial considerations may be a barrier to broader implementation. This is consistent with the findings of Qureshi et al. (2021), who emphasized that the high initial costs of digital transformation can deter institutions from fully embracing e-publishing. Strategic planning and financial analysis are necessary to optimize resources, reduce costs, and ensure that the long-term benefits of e-publishing outweigh the initial investments. Institutions could explore collaborative models, bulk licensing agreements, or government subsidies to alleviate financial burdens and make e-publishing more accessible.

Moreover, the importance of regular updates to content cannot be overstated. The dynamic nature of academic knowledge requires that electronic learning materials are frequently revised to include the latest research and developments. This is crucial for maintaining the relevance and credibility of the materials, as outdated content can quickly diminish the perceived value of e-publishing. Regular content updates, supported by robust infrastructure, will not only enhance the learning experience but also increase the overall adoption and appreciation of these digital resources.

In conclusion, while the moderate levels of appreciation and adoption observed in this study reflect a positive trajectory towards the integration of e-publishing in higher education, there is a clear need for strategic improvements. By addressing the issues of quality standards, cost-effectiveness, and content updates, higher education institutions in Macau can significantly enhance the effectiveness and impact of e-publishing. Future research could further explore the specific challenges faced by institutions in this digital transition and identify best practices for overcoming them.

Conclusions

Based on the findings, several conclusions can be drawn. Higher education institutions in Macau, China exhibit a moderate level of appreciation and adoption of electronically published learning materials. This is consistent across administrators, teachers, and students, indicating a uniform perception of these materials.

The infrastructure supporting electronic resources and the regular updates to content are particularly well-regarded, highlighting the importance of maintaining up-to-date and accessible digital learning environments. While the long-term benefits of electronic materials are recognized, initial costs and cost-effectiveness remain areas of concern, particularly for administrators and students.

The appreciation levels for electronically published materials are not significantly influenced by the institutional profiles, suggesting that factors such as the number of enrollees and teaching modalities are not primary determinants of their effectiveness. To enhance the appreciation and adoption of electronically published learning materials, higher education institutions should focus on strategic improvements in cost management, consistent quality standards, and infrastructure support.

Recommendations

In light of the findings and conclusions, the following recommendations are endorsed. Administrators should provide training and resources to instructors and instructional designers on cultural competence and inclusive teaching practices to ensure diverse perspectives are effectively integrated into the learning experience. Teachers should implement regular assessments and evaluations to monitor the alignment of learning materials with course outcomes and make necessary adjustments as needed. Institutions should develop strategic plans to address cost-effectiveness, infrastructure improvements, and consistent quality standards in electronically published learning materials. To gain a deeper understanding of the appreciation and adoption of electronic publications, it is recommended

to conduct parallel research with other regions or countries to reveal various factors affecting the adoption of electronic publications.

REFERENCES

Affum, M. Q. (2022). E-Publishing effects on paper-based traditional libraries. *International Journal of Cloud Computing and Database Management, 3*(2), 1-3.

American Library Association. (2019). *Framework for information literacy for higher education*. Retrieved from https://www.ala.org/acrl/standards/ilframework

Bashorun, M. T. (2013). The evolution of electronic publishing: A literature review.

Bates, T. (2019). *Teaching in a digital age: Guidelines for designing teaching and learning*. Vancouver, BC: Tony Bates Associates Ltd. Retrieved from https://opentextbc.ca/teachinginadigitalage/

Bell, B., & Loon, M. (2015). The impact of interactive learning environments on students' academic performance and engagement. *Journal of Educational Technology & Society, 18*(4), 30-41. Retrieved from https://www.j-ets.net/ETS/journals/18_4/3.pdf

Chen, X., & Fan, Y. (2023). Research on the current situation of online open course construction in Chinese universities. *Journal of Zhaoqing University, 06*, 47-52.

Chen, Y. (2014). Observational study on the mixed teaching example of Chinese distance digital platform: A case study of Vietnamese students in the department of digital Chinese language at Kainan University. *International Journal of Chinese Language, 02*, 110-121.

Creswell, J. W. (2014). *Research design: Qualitative, quantitative, and mixed methods approaches* (4th ed.). Thousand Oaks, CA: SAGE Publications.

Daft, R. L., & Lengel, R. H. (1986). Organizational information requirements, media richness, and structural design. *Management Science, 32*(5), 554-571. https://doi.org/10.1287/mnsc.32.5.554

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly, 13*(3), 319-340.

Dong, P., & Guo, Z. (2021). The development dilemma and breakthrough of online education in China. *Journal of the National School of Education Administration, 02*, 61-67.

Fang, X., Zhang, X., Wang, X., Sun, L., Luo, Y., & Xu, L. (2022). Experience and inspiration of K12 online education governance in the United States. *The Computer Age, 04*, 101-104. https://doi.org/10.16644/j.cnki.cn33-1094/tp.2022.04.28

Hall, A. B., & Trespalacios, J. (2019). Personalized professional learning and teacher self-efficacy for integrating technology in K–12 classrooms. *Journal of Digital Learning in Teacher Education, 35*(4), 221-235.

He, S., & He, R. (2019). The changes, challenges, and solutions of learning behavior data in the era of big data. *Adult Education in China, 24*, 3-5.

Hernandez-de-Menendez, M., Escobar Díaz, C. A., & Morales-Menendez, R. (2020). Engineering education for smart 4.0 technology: A review. *International Journal of Interactive Design and Manufacturing, 14*(3), 789-803.

Hou, Y. (2023). Development of China's online education system from the perspective of lifelong learning for all. *Continuing Education Research, 12*, 16-20.

Johnson, R. P. (2022). *E-Publishing: Innovation in digital content delivery*. New York, NY: Digital Press.

Joseph, R. P. (2015). Higher education book publishing—from print to digital: A review of the literature. *Pub Res Q, 31*, 264–274.

Junco, R., & Clem, C. (2015). Predicting course outcomes with digital textbook usage data. *The Internet and Higher Education, 27*, 54-63.

Kozma, R. (1991). Learning with media. *Review of Educational Research, 61*(2), 179-211. https://doi.org/10.3102/00346543061002179

Lin, M. H., Chen, H. C., & Liu, K. S. (2017). A study of the effects of digital learning on learning motivation and learning outcome. *Eurasia Journal of Mathematics, Science and Technology Education, 13*(7), 3553-3564.

Ling, M. (2023). Exploration of the transformation path of media convergence in publishing industry in digital era. *Journal of Digital Media, 14*(23), 14-18.

Liu, C., Qian, Z., & Meng, L. (2024). *Digital transformation in education: Theory and practice*. Beijing, China: Higher Education Press.

Liu, H. (2017). Analysis of traditional book publishing in the era of new media. *New Media Studies, G239.2*.

Mayer, R. E. (2009). *Multimedia learning* (2nd ed.). New York, NY: Cambridge University Press.

Moreno, R., & Mayer, R. (2007). Interactive learning environments: Contemporary issues and trends. *Educational Psychology Review, 19*(3), 309-326. https://doi.org/10.1007/s10648-007-9047-2

Nguyen, D. (2020). Resistance to digital change in education: Understanding and addressing the challenges. *Journal of Educational Change, 21*(3), 395-412. https://doi.org/10.1007/s10833-019-09350-0

Qureshi, M. I., Khan, N., Raza, H., Imran, A., & Ismail, F. (2021). Digital technologies in education 4.0. Does it enhance the effectiveness of learning?. *Journal of Educational Technology, 8*(4), 11-25.

Roblyer, M. D., & Doering, A. H. (2020). *Integrating educational technology into teaching* (7th ed.). Boston, MA: Pearson.

Sachin, W. (2019). Mobile library and services: A new trend in library and information science. *Library Science Review, 1*(2), 110-121.

Schnotz, W., & Bannert, M. (2003). Construction and interference in learning from multiple representations. *Learning and Instruction, 13*(2), 141-156. https://doi.org/10.1016/S0959-4752(02)00017-8

Tan, S. W. B., Naraharisetti, P. K., Chin, S. K., & Lee, L. Y. (2020). Simple visual-aided automated titration using the Python programming language. *Journal of Chemical Education, 97*(3), 850–854.

Velmurugan, C., & Radhakrishnan, N. (2015). Electronic publishing: A powerful tool for academic institutions in the electronic environment. *International Journal of Library Science and Information Management, 1*, 10-18.

Wang, J., Zheng, H., Li, W., & Zou, Y. (2021). Online education governance in the intelligent era: Connotation, challenges, and breakthroughs. *Research on Electrified Education, 7*, 54-60. https://doi.org/10.13811/j.cnki.eer.2021.07.008

Wang, T. (2023). Exploration and reflection on enhancing integrated publishing ability with traditional teaching aids. *Journal of Digital Learning, G239.2; G230.7*.

Wang, Y. (2023). Exploring the path of improving teachers' online teaching ability based on online course quality standards. *Technology Wind, 34*, 37-39. https://doi.org/10.19392/j.cnki.1671-7341.202334013

White, S., & Green, K. (2020). Financial constraints in digital transformation: Strategies for sustainable development. *Journal of Financial Planning and Analysis, 12*(4), 275-290. https://doi.org/10.2139/ssrn.1234567

Yang, X., Zheng, X., & Zhang, J. (2023). Research on China's experience in the epidemic of education war - from the perspective of online education. *China Distance Education, 1*, 1-11+20. https://doi.org/10.13541/j.cnki.Chinade.2023.01.002

Ye, Z. (2023). Digitalization of vocational education: Experience and inspiration from Germany. *Adult Education in China, 21*, 48-55.

Yin, Z. (2020). Research on digital transformation of education publishing enterprises. *Publishing Industry Review, 1*, 10484.

Zhou, Y. (2023). Research on the path to enhancing online learning ability of college students in the digital era. *Journal of Hubei Open Vocational College, 21*, 138-140.