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Modernization Through Digitalization: A Review on how Digitalization Drives Learning and Management Practices in Chinese Higher Education Institutions

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ABSTRACT

Digitalization is a driving force in actualizing the modernization agenda in Chinese higher education institutions. Thus, recent studies have explored the evolving applications of digital technologies in modernizing higher education activities. However, a comprehensive study detailing how digitalization drives learning and management practices is lacking in the literature. Therefore, this literature review identifies and discusses specific learning and management practices that have been enhanced through digitalization. Findings revealed that digitalization has transformed higher education practices, such as online learning, mobile learning, archive management, financial management, electronic document management, campus security management, and student attendance management. This study contributes to the debate on the role of digitalization as the key component of higher education modernization.

INTRODUCTION

Higher education institutions in China have been at the centre stage of rapid technological transformations in rolling out academic activities, management practices and services. This transformative trend is reflective of the progress already made to advance higher education development and achieve the goals of the modernization agenda. It is worth noting that current efforts aiming at achieving higher education modernization in China have been largely skewed towards the digitalization of learning and management practices (Sui, 2020). Moreover, evolving trends in digital innovation, such as artificial intelligence, have added impetus to the wind of change currently evidenced in the academic and management systems of Chinese universities and colleges (Liu-Schuppener, 2023). The traditional practices that used to dominate higher education service delivery are slowly shrinking, giving way to innovative and more effective interventions. However, the gains in digitalization have not been sufficiently explored in the context of learning and management practices in higher education institutions. As new modes of teaching, learning and management practices are emerging, so are researchers marshalling their efforts to embark on scholarly exploration of the related issues and trends (e.g., Miao, 2022; Perrin & Wang, 2021). The scope of these scholarly investigations is multifaceted, thereby drawing attention to debates on the role of modernization in facilitating the digitalization effects permeating higher education service delivery in China.

The Path Towards Higher Education Modernization Through Digitalization

Since the rolling out of the Chinese reform and opening-

up policy in 1978, there has been remarkable policy shifts oriented towards modernizing education, science and technology among others. The higher education sector has been at the forefront of pushing forward the modernization agenda with the goal of creating a modern higher education architecture that encompasses Chinese characteristics (Yan & Cai, 2019). In this respect, modernizing higher education is essentially intertwined with modernizing all other sectors of society. Therefore, it is assumed that actualizing higher education modernization can ultimately accelerate development in human resources thus influencing development in other spheres of the state. Consistent with the spirit of modernization, China has activated major changes to the structure of higher education, introducing one that follows international best practices (Yuan, 2018). This modernized higher education model emphasises on the cultivation of high-quality knowledge and skills that align with optimum quality and standards. Hence, higher education institutions in China have been at the receiving end of increased support to make them match world-class standards and become more productive (Sui, 2020; Yuan, 2018). Higher education modernization also attaches importance to quality improvement and functional growth through research and teaching. The number of research publications has increased tremendously over the past decade with enormous focus on education, science and technology (e.g., Sun *et al.*, 2022; Zhao & Zhang, 2018). The role of digitalization in the path towards modernization cannot be over emphasised. The digitalization of higher education has received unprecedented attention recently, thus creating space for the design and implementation of novel digital education tools and resources (Jin & Shang, 2022). It is acknowledged that the high level of

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transformation in higher education digitalization that has been achieved points to the success of China's 2010-2020 Education Reform and Development Plan (Tulunova & Rulienė, 2022).

The digital transformative strand continues to leap forward in unprecedented ways opening up opportunities for reforms in policies and pedagogical applications. Recent reforms of the higher education management system are largely attributed to these advancements in the digitalization process. This has directly influenced changes in learning and management practices. Moreover, studies have indicated the positive effect higher education digitalization has placed on high quality and achievement outcomes in learning (e.g., Geng *et al.*, 2022; Hay, 2022)

The Link Between Higher Education Modernization and Digitalization

Various perspectives prevail on the conceptual thrust of higher education modernization in China. However, it seems that scholars have not reached a clear conceptual consensus on higher education modernization in the context of digitalization. I therefore set out, at this point of the review, to explicate on the dimensions of thoughts on the study concepts and ultimately establish a path for this paper. In this respect, a thorough discussion of higher education modernization and digitalization cannot ignore the broader perspective of modernization in China.

The concept of modernization has evolved over the past decades based on China's development priorities. It is noteworthy that a key thrust of the modernization process is to "prioritize both education development and education to promote national development, paving the path to pursue and surpass international standards" (Yuan, 2018, pp. 27- 28). The latest conceptual outlook redefined the "four modernizations" as consisting of digitalization, industrialization, urbanization, and agricultural modernization (Sui, 2020). Arguably, education modernization in China is influenced by an interplay of factors that relates to the overall goal of national development. This national modernization process bears a reciprocal relationship with education modernization (Yuan, 2018). Because educational modernization largely contributes to national modernization, its manifestation depicts national modernization in the education sector. Ultimately, "education modernization provides talents for national modernization, firmly guarantees and lays the foundation" (Xie *et al.*, 2021, p.355). Thus, the Chinese government puts a premium on education modernization as a way of facilitating and strengthening sustainable development at the state level. In this regard, the higher education sector is considered as the central agent in actualizing this modernization agenda.

Additionally, scholars have sought and established the connection between higher education and modernization. For instance, Sui (2020) defined higher education modernization as "a target system and effort making with reference to the most advanced international higher

education, reflecting the best status of current or future higher education development" (p. 131). This definition of higher education modernization underscores an aspiration towards attaining high quality and standards as well as inculcating current best practices in education service delivery. Zhao and Zhang (2018) identified five goals for the modernization of higher education in China, which include, modernization of educational concept, equipment, management, content and contingent. Another study involving 75 top universities in China indicated that the universities perceive digitalization from two dimensions – modernization and instrumentality (Xiao, 2019). Modernization, in this respect, involves developing and sustaining systems that promote effective teaching and learning innovations.

Based on the established conceptual framework of higher education modernization, Sui (2020) identified the following six components of higher education modernization; universalization, quality, good governance structure, internationalization, digitalization, and a learning society. Though there is no stated order of importance for the outlined components of higher education modernization, I have attached importance to digitalization of higher education for the purpose of this paper. Conceptually, digitalization involves the integration of digital tools to facilitate the operations and services of intuitions (Xiao, 2023). Therefore, in this paper, higher education digitalization is defined as the process of modernizing the activities, services and practices of higher education institutions through application of a range of digital resources.

Obviously, there is a clear link between higher education modernization and digitalization. Wu and Liu (2017) argued that the process of higher education modernization involves actualizing the goal of modernizing teaching concept, teaching content, learning resources, teaching and learning equipment, and management activities. These strings of factors are critical to promoting higher education modernization. It is worth mentioning that this move towards modernizing learning resources, learning equipment and management tasks reflects recent transformations in higher education as a result of internet connectivity and information communication technology advancements. Similarly, Yankum and Jing (2019) viewed the modernization of higher education as a combination of internet and education resulting to transformations in teaching and learning through the use of online platforms. Yan and Cai (2019) pointed out that technological advancement is a key driver of higher education modernization in China. Their thoughts on the role of technology posit digitalization as central within the modernization framework. Additionally, Hay (2022) pointed out that China's higher education has utilized digitalization to engender economic and social development. Specifically, he highlighted the improvements brought upon education quality through the use of digital technologies. It is not surprising that the

strategic plans of top universities in China have captured digitalization as a means of attaining higher education modernization through the construction of e-campus systems and application of technological innovations in teaching and learning (Xiao, 2019). Hence, these novelties are somewhat connected with the digitalization of higher education that this paper sets out to explore.

Statement of the Problem

Higher education modernization is rarely discussed in the context of digitalization, particularly in light of the rapid transformations in higher education service delivery and practices. While individual studies focusing on either higher education modernization or higher education digitalization continue to emerge, there is an absence of a comprehensive review that can merge such studies in a holistic conceptual framework.

Moreover, over the past decade, studies focusing on the transformations relating to higher education digitalization have surged. These studies have revealed the changing patterns in higher education learning and management practices. Therefore, the absence of a study that provides an understanding of current research trajectories on higher education digitalization has necessitated the conduct of this review. Against the backdrop of problems necessitating this research, the review seeks to investigate the technological innovations that drive learning and management practices in China's higher education institution in response to the education modernization agenda.

Research Questions

1. What learning practices have been enhanced through digitalization as documented in existing literature?
2. What management practices have been enhanced through digitalization, according to the published literature?

MATERIALS AND METHODS

Study Design

This paper adopts a qualitative review methodology, synthesizing findings from peer-reviewed journals and books. The review identifies emerging trends in the digitalization of learning and management practices in Chinese higher education institutions.

Search Procedure

In a bid to locate relevant and quality publications for the review, a comprehensive search of Semantic Scholar, ERIC and Academic Search Ultimate (EBSCO) databases was carried out. Search items included the following keyword search relating to the study topic: modernization AND digitalization OR digital learning OR digital management AND Chinese higher education.

Also, the search was limited to English publications from January 2017 to December 2022. Relevant publications were identified and included for further assessment and consideration based on the key eligibility criteria.

RESULTS AND DISCUSSION

Digitalization of Learning Practices

Higher education learning practices have evolved during the past decade. The online learning mode has gained significance as the most suitable means of ensuring continuity and sustainability of higher education teaching and learning during COVID-19. Perrin and Wang (2021) underscored the rapid digitalization of teaching and learning in a Chinese higher education institution as a result of COVID-19. The study informs on the current digitalization trajectory involving a shift from traditional education to digital education as occasioned by the exegesis of the pandemic period. The researchers argued that the higher education digitalization process has gained impetus primarily in reaction to the demands of the COVID-19 situation. Also, they urged for increased efforts towards the sustainability of the digitalization of learning practices by deepening quality assurance measures. In a similar path, He and Xiao (2021) investigated the shift to online learning during COVID-19 and the factors that inform its effective implementation in Chinese universities. Factors considered in the study include, online tools adopted by teachers, pedagogical methods adopted by teachers, students' satisfaction of teachers and their teaching among others. The results showed that the online learning mode demonstrates teaching and learning effectiveness against the backdrop of initial challenges arising from insufficient preparedness.

Evidently, studies had been carried out on online learning in China before the onset of COVID-19. Prior to the pandemic, online learning was already gaining momentum. Arguably, this is attributed to the progress made in the digitalization process. For instance, Wang *et al.* (2018) investigated the history, challenges and opportunities for E-learning (online learning) in China. Their study revealed that online learning has been carried out in China since the 1990s and it has the potential to create opportunities for more infrastructure, education expansion as well as education equity and inclusivity. The need for more studies focusing on teachers' technological competence and production of appropriate e-learning resources are emphasised among others. However, Tulunova and Rulene (2022) stressed that the sustainability of the successes achieved in higher education digitalization would be far-fetched unless consideration is given to the pedagogical design of more digital educational resources. In addition, Xiao (2019) highlighted the lack of incentives to get universities use digital technologies on a wider scale for the purpose of teaching and research.

Many other studies have explored the impact of digitalization on higher education outcomes as a result of online learning. For instance, Sun *et al.* (2022) pointed out that digitalization creates the platform for building quality education outcomes. They argued that postgraduates' possession of digital skills should now be a priority for higher education institutions emphasizing that it constitutes an invaluable support to quality education and sustainable development. The study explored a range

of digitalization practices specific to online learning and their influence on postgraduates' performance outcomes. Results showed that information literacy and an effective online learning environment exert a positive influence on innovation performance and stimulate high-quality learning. Furthermore, Geng *et al.* (2022) also argued that online education (teaching and learning) fosters development of high quality and performance in higher education. Focusing on undergraduates in a Chinese university, they explored the associations between online education and students' academic record during COVID-19. Interestingly, the results indicated a steady and marked improvement on students' academic record at the time of online teaching and learning. In another study, Liu *et al.* (2020) analysed the bearing of online teaching and learning on quality and potential transformations in higher education institutions. Adopting a mixed methods approach, the study revealed that the digitalization of higher education institutions has made it possible for a swift transition from the existing traditional mode of learning to online learning. Further, the study showed that higher education institutions are already experiencing massive transformations as a result of online teaching and learning, emphasizing on the need for more quality assurance measures.

While investigating the implementation of online education at Peking University, Bao (2020) proposed strategic principles that would promote an enriching and productive online teaching and learning experience. These include, appropriateness of teaching content with respect to students' online learning behaviour, effective lesson delivery done at an appropriate pace, timely feedback on learning tasks, active participation during online lessons, and preparedness to handle emerging challenges. The researcher argued that these principles could serve as a blueprint for a more efficient online teaching and learning in higher education institutions. Huggins *et al.* (2022) have also added to the growing number of research on online learning practices in Chinese universities. Their study reflected on students' engagement patterns in online learning and found that the level of students' engagement with online learning platforms is predictive of their social influence and the quality of available information. Alternately, Tsegay *et al.* (2022) explored the benefits and challenges associated with online learning practices in China during COVID-19. Mainly focusing on university teachers, the study showed that the transition to online teaching and learning was spontaneous and abrupt thus limiting the time for adequate preparations. While the study also highlighted initial online learning limitations with respect to learner's social interaction and field experience, it recognized the potential effect on transforming teaching and learning practices in higher education.

At the same time, mobile learning is another trending higher education learning practice influenced by the digitalization process. Yuan and Chow (2021) investigated

autonomous mobile learning in Chinese higher education and found that it enables students gain knowledge quickly and efficiently. Along similar path of investigating students' engagement in mobile learning, Lin and Su (2020) focused on the relationship underpinning Chinese students motivational needs, attitude and intention to engage in mobile learning. The study showed that students' attitudes and intention to engage in mobile learning practices are strongly associated with their affective and entertainment needs. Exploring the growing application of mobile learning during COVID-19 in China, Yu and Zhang (2021) employed a mixed method design in their study on the technical and individual factors influencing mobile learning in higher education. The study found that technical factors such as, user interface, facilitating condition and mobile device limitation strongly correlates with mobile learning acceptance and efficiency. Therefore, these technical factors are more likely to influence students' decision to engage in mobile learning practices, thus positively affecting mobile learning efficiency.

Digitalization of Management Practices

Application of digitalization is also taking root within the administration and management domains of higher education institutions in China. This adds momentum to the current shift from the long existing traditional education management practices in colleges and universities. Essentially, the traditional higher education management mode adopted a rigid approach which is in stark contrast with the flexibility and efficiency that digitalization has ushered into higher education management practice. Recently, Miao (2022) contributed to the digitalization of higher education administration and management in a study that involves the use of management technology to accelerate the response speed of the existing university education management system. The study results showed that the new management technology is helpful in improving on response time. Furthermore, Jin and Shang (2022) investigated the potential an integrated digitalized practice in higher education management and service delivery. They focused the use of WeCom at the Guangdong Ocean University. This integrated platform has provided a "one-stop service" for facilitating management activities and a host of services for teachers and students on campus. The study showed that such an integrated platform could foster efficient management in universities.

In a study investigating the impact of digitalization on documents management, Chen (2020) provided insights into the electronic documents management practices of Chinese universities. Though the study revealed problems such as, low levels of process control and utilization of electronic documents information resources, it underscores the positive impact that an improvement on the digitalization process will bear on electronic documents management.

Furthermore, some of the studies have explored the

bearing of digitalization on financial management, which is the main backbone of the functions of any institution. Guan and Chen (2022) focused on the implementation of a financial management system for higher education institutions in China. They developed a financial management system that is enhanced by a deep learning driven software. This innovation has proven to be extremely helpful in reducing risks associated with university financial transactions. Similarly, Li (2020) investigated the reform of higher education systems as a result of the digitalization of financial management in universities. The study showed that the use of an information technology enhanced financial management information platform has enhanced the efficiency in the delivery of financial services and overall management of finances.

At the same time, a study by Ma and Yang (2021) highlighted the effect of digitalization on the execution of security management tasks in Chinese higher education institutions. They investigated the implementation of an artificial intelligence enhanced security monitoring management system that can be of tremendous use in universities to assist in providing effective security management on campuses. The study showed that the security monitoring management system exhibits high level of performance thus underscoring its effectiveness in improving on existing security conditions in higher education settings.

Another area involving higher education digitalization that has received scholarly attention lately is student attendance management. For those of us who can still remember, the old school practise was mainly recording of attendance on a paper made register and teachers are required the balance their registers on a daily basis.

Currently, the entire process is now carried out digitally requiring minimal physical efforts. There are attendance management systems that can provide real time information and accurate attendance records of both teachers and students. These are extensively in use at universities to keep track of students' attendance patterns and provide accurate assessment.

As time progresses, advances in the digitalization of higher education continue to deepen. More innovations are now directed at improving on the functions of higher education institutions. This review has shed a spotlight on the unfolding effects of digitalization on higher education in the domains of online learning, mobile learning, archive management, financial management, electronic document management, campus security management and student attendance management (see Figure 1). The entire higher education architecture is at the receiving end of this digital revolution thus creating new opportunities for education advancement. It is noteworthy that new digital technologies are being designed and implemented to facilitate efficient and productive service delivery in higher education institutions. As these innovations penetrate and transform higher education learning and management practices, more scholarly investigations and explorations will continue to emerge.

Discussion

Higher Education Digitalization Practices

The rapid growth in higher education digitalization has revolutionized the operations and functions of Chinese higher institutions over the past five years. It is absolutely certain that the inception of COVID-19 has triggered diversifications in patterns of lesson delivery and learning acquisition. Notably, the higher education sector in China

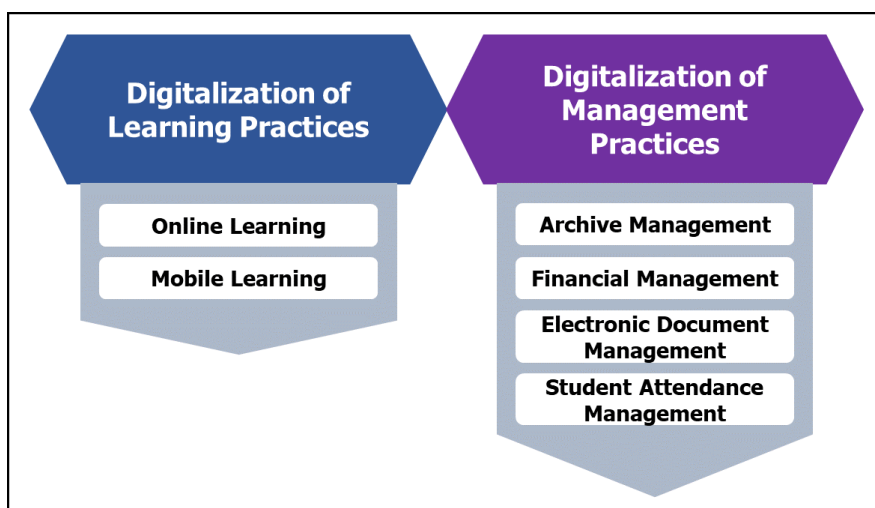


Figure 1: Learning and Management Practices Influenced by Digitalization

was one of the first to deepen the digitalization drive by opening up the learning space through the application of diverse digital innovations. This move in the direction of institutionalizing digitalization is consistent with the goals of higher education modernization oriented towards accelerating education development for the holistic

development of the state. However, it must be noted that digitalization of education in China has been a priority for the overall modernization of the education sector. So the situation of the pandemic was just an opportunity to expand and strengthen its application in novel ways. This reality is supported by the incremental trend of the

publications on, generally, the path of higher education digitalization research (see figure 1) and, specifically, the digitalization of learning and management practices (see figure 1). Therefore, the higher education sector bears the responsibility of actualizing its own modernization through innovative and viable means such as the digitalization of its functions.

Technological Innovations in Learning Practices

Currently, online learning has emerged as a popular and widely applied practice in higher education. As a result, a growing number of researchers have found interest in carrying out studies on online learning practices over the past three years (He & Xiao, 2021; Perrin & Wang, 2021). An incremental trend in the number of publications is noticeable from the review conducted, especially starting from 2020 to 2022. For these researchers, online learning is a new normal that needs to be investigated thoroughly for improvement, positive impact and sustainability. For instance, some of the studies focus on investigating online learning practices in China with respect to its influence on academic quality, students' learning motivation and engagement, students' performance as well as its impact on current transformations in higher education institutions.

Significantly, the reviewed studies are consistent in their reporting of the positive influence that online learning practices continue exert on education outcomes (Geng *et al.*, 2022; Sun *et al.*, 2022)). Research results have indicated that the rolling out of online learning practices has created opportunities for equity and inclusion within the higher education space. Also, students' performance outcomes have remained impressive since the popularization of online learning. However, there are existing challenges regarding the practice of online learning as reported. These challenges largely relate to limitations in learning interactions and the competence level of both teachers and learners in the use of associated resources. By and large, the studies have underscored the transforming role of online learning in China's higher education. These online learning practices are closing the learning gap and opening up opportunities for access to higher education. Complimentary to online learning is mobile learning. Advancements in the digitalization process have also impacted on mobile learning practices in the higher education domain. Evidence from the reviews suggests a slow but promising shift of research focus towards shining a spot light on the potential of mobile learning to transform higher education pedagogy. The studies revealed a unique learning dimension in the practice of mobile learning, which relates to autonomy in the learning process. Apparently, the current trend in mobile learning is skewed towards self-directed and autonomous learning (Yuan & Chow, 2021). This learning style allows for greater flexibility and accessibility of resources in the learning process. It enriches the learning experience by enhancing individual and interactive learning practices. On the basis of the underlying limitations posed by mobile

learning, the authors called for the implementation of a collaborative mobile learning platform.

Technological Innovations in Management Practices

Higher education management practices have been transformed as a result of recent advances in the digitalization of higher education institutions. As a result of digitalization, technological innovations have been brought to bear on the normal management practices of universities and colleges in China. These include systems and tools that are driven by artificial intelligence and block-chain technologies. The studies reviewed highlighted a range of diverse purposes for which digitalization has been applied within their management architecture. The ultimate goal for the digitalization of management practices in higher education is to maximize efficiency and speed in service delivery.

Financial management is a key management practice that has received remarkable transformation because of digitalization. Authors have focused on investigating the extent to which digitalization has been implemented to leverage financial management efficiency in higher education institutions (Li, 2020). The indicators of financial management propriety because of digitalization are very impressive. The implementation of a digital financial management system has resulted in risk reduction in university financial transactions as well as increased efficiency in financial service delivery (Guan & Chen, 2022). The need for the implementation of more advanced financial management systems to be used for the overall management of higher education institutions is suggested.

At the same time, studies have highlighted the contribution of digitalization in facilitating both documents and archive management practices (Chen, 2020). These are higher education management tasks that are crucial to the effective running of education institutions. Prior to the digitalization of these management functions, it was cumbersome and time consuming to carry out such tasks. With the use of digital technologies, these document management tasks are now carried-out more easily. The archive management system is helpful to both teachers and students as it saves them time to locate and retrieve materials from digital resource platforms. Similarly, electronic documentation is now a key management function in higher education institutions. It is helping in enhancing proper records keeping as well as retrieval and processing of information by administrators in higher education institutions. Seemingly, it is an area of management that requires the processing of huge chunks of data relating to the overall functioning of universities and colleges. With the application of digital technologies these tasks have been made simple. However, the studies highlighted limitations relating to the level of efficiency and quality output of existing systems. In view of this, the future incorporation of block-chain technology into existing systems is suggested for future studies.

In addition, both students' attendance management and

security management are practices that the digitalization of higher education has impacted positively. Researchers have underscored the sanity on class participation and attendance that the digitalization of students' attendance has achieved. Similarly, the digitized security management system is a huge step towards minimizing crimes and improving the general security conditions on campuses. The application of more advanced artificial intelligent driven systems is suggested to facilitate students' attendance and security management tasks at universities and colleges (Ma & Yang, 2021).

Last but not the least, a thrilling practice reported in the studies relates to the use of WeChat as a unified platform to manage a host of higher education functions. This novelty in higher education that is now widely used for a range of higher education management tasks. It is reported to be effective in course management, information management and academic resource management among others. It is already simplifying tasks that once required lots of time and energy to accomplish. The potential of this digital application in transforming the general management of higher education is very huge and promising (Jin & Shang, 2022).

With all these promising learning and management trends, higher education in China is taking the lead in the modernization of education and ultimately the state. It is now time for more studies to be conducted in order to leverage the gains for further national and human capital development. In addition, future research must seek to address the gaps revealed in the studies so as to enable the design of technological tools that can better serve in the interest of education development. On the same token, more scientific studies exploring the impact of online learning needs to be carried out for a better understanding of its gains and challenges.

CONCLUSION

Considering current research trajectories on digitalization of higher education in China, it is safe to conclude that higher education modernization is now at a point of rapid growth. This review advances scholarly debates and offers irrefutable evidence establishing digitalization as a key component of the higher education modernization agenda. It is imperative that the transformation driven by digitalization be nurtured to its full manifestation while acknowledging and initiating solutions to tackle the obvious barriers and challenges that may arise. Furthermore, the review showed that Higher education institutions in China have exhibited resounding resourcefulness and resilience based on a tirade of learning and management innovations over the past years. The on-going digitalization process has increased access to higher education learning and maximized equity and inclusion in the higher education sector.

Importantly, the study highlights the specific ways digitalization is driving online learning, mobile learning, archive management, financial management, electronic document management, campus security management

and student attendance management in higher education institutions. Evidently, learning and management practices continue to evolve and research into this new trend is spiralling exponentially. It seems that in spite of the renewed interest to engage in a scholarly exploration of the emerging practices, lots of gaps remain to be filled in the available literature. Future studies could explore current trends in the digitalization of higher education with particular focus on the application of artificial intelligence.

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