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Review Article

Digital Transformation Policies in Education: Practical Experiences in Vietnam

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Abstract: Digitalization is radically disruptive and changing the fundamental assumptions of the way of life and organization of work in a postmodern society, which is becoming more globalized and more digitalized than ever before. Therefore, it is becoming increasingly important for organizations to quickly, efficiently, and appropriately plan the digital transformation to achieve flexibility and to maintain market competitiveness. In this context, the understanding of digitalization and related concepts is vital. The paper explores the journey of integrating digital technologies into Vietnam's education system. The study delves into the evolution of policies related to digital transformation and their implementation at the school level. By examining the transition from theoretical frameworks to practical applications, the paper sheds light on the challenges and successes encountered in this process. Through detailed analysis, the paper offers valuable insights into the digital transformation of education in Vietnam, highlighting the critical link between policy formulation and its real-world implementation within educational institutions.

Keywords: Education, Digitalization; Policies of Digitalization in Education; digital transformation.

1. Introduction

Digital technologies play a pivotal role in education and training systems around the world, offering access to an array of learning resources and the potential to revolutionize teaching practices both within schools and beyond. By harnessing novel data collection and analysis techniques, these technologies enhance decision-making in the realm of education and training.

The aim of this research is to analyze policies that support the digital transformation in education based on state program documents on digitalization and analysis of digital learning services and resources for school students. The study has to answer the questions: How does the national policy level in Vietnam carry out the digital transformation of school education? What are their priorities in this area?

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What digital learning resources and services are developed and used by schools? How are they integrated in to the process of schooling?

What are the challenges experienced by Vietnam during the digital transformation of schools, and what are the solutions to these challenges?

2. Literature Review

Digital education technologies hold the promise of significantly improving student outcomes by enabling educational systems at all levels to better cater to the unique needs of their students. They empower educators to deliver high-quality instruction and enhance the effectiveness of the learning process. Through the strategic use of digital technologies, instruction can be made more engaging and tailored to individual learning needs and interests (Ganimian, Vegas, and Hess, 2020) [1]. These technologies not only augment educators' impact but also help bridge learning disparities, fostering more inclusive educational systems (ICF Consulting Services Ltd., 2015). [2] Beyond academic achievement, the incorporation of digital education technologies has been acknowledged for its potential to create engaging and enjoyable learning experiences. It also promotes the development of non-cognitive skills and broadens students' horizons by connecting them with diverse people and ideas from around the world (OECD, 2020) [3].

The extensive and interconnected effects of digitalization on student learning, teachers' time and development, school infrastructure, and education system management present challenges that demand a comprehensive policy approach. Project "Strengthening IT applications and digital transformation in e-education for the period 2021-2025 and orientation to 2030" aims to create policy corridors, propose main tasks and solutions to deploy IT applications and digital transformation in the education sector until 2025 and orientation to 2030 to explore how we can formulate comprehensive policies at the systemic level, facilitating excellence and equity within the educational sectors of Vietnam in the digital era. This endeavor seeks to scrutinize the policy framework essential for fostering a more efficient and inclusive integration of digital resources in education [4].

Digitalization refers to the process of converting information, data, or physical objects into a digital format. It involves the use of digital technologies to transform various aspects of life, business, and society. Digitalization encompasses the adoption and integration of digital technologies into different areas, such as communication, education, healthcare, manufacturing, and more.

In the context of business, digitalization involves leveraging digital technologies to optimize processes, enhance efficiency, and improve customer experiences. It often includes the use of tools like the internet, cloud computing, data analytics, artificial intelligence, and automation.

Digitalization is a broad term that encompasses the entire transformation journey, including the digitization of existing processes (converting analog information into digital format) and the digital transformation of business and organizational activities, which involves using digital technologies to fundamentally change how businesses operate and deliver value to customers. Education, both as an economic sector and a knowledge transfer process, is undergoing transformative changes due to the pervasive influence of information and communication technologies (ICT). These changes manifest in four key areas within educational organizations (EOs): pedagogy, technology, management, and economics.

In the realm of pedagogy, there exists a spectrum ranging from traditional education to technology-based education, with hybrid models bridging the gap between the two. The technological sphere encompasses various ICT tools used for educational purposes. Organizational changes stem from the integration of ICT in managing educational institutions. Additionally, there are shifts in the economic models underpinning the delivery of

education. Studying these changes requires an understanding of their distinct yet interconnected dynamics.

Technological advancements can be categorized into different generations, each associated with specific educational models. This evolution spans from printed materials and distance learning to contemporary electronic content and flexible learning models [5] The educational process can be segmented into phases: content development and demonstration, material consolidation, knowledge and activity assessment, and evaluation. Technological reinforcement primarily occurs through the utilization of diverse software products tailored for each phase. These include tutor programs, electronic textbooks, business games, semantic networks, glossaries, simulations, digital twins, subject-oriented systems, virtual and augmented reality, artificial intelligence, and test programs (Gillpatrick, 2020; Newman, 2017) [6].

The progression of ICT has profoundly shaped technology-based education methods and the modern educational environment within institutions. Technology and automation play pivotal roles in enhancing productivity in education, a trend expected to persist [7]. Various forms of such education include electronic self-education through video materials, training via social networks, virtual environment-based education, distance learning, and e-learning environments equipped with learning management systems (LMS) such as Moodle, Sakai, Blackboard, WebCT, and Canvas, along with virtual educational environments (Schmidt and Tang, 2020) [8]. Since the 2000s, the topic of digitalizing education has been closely linked to evaluating both the positive and negative effects of this process. (Johnston & Baker, 2002) presented the results of innovative online teaching technologies and assessed their impact across various areas: cognitive and affective spheres, adult education results, changes in pedagogy, improvements in teachers' technological skills, and technological integration in learning [9]. Studies by M. Ragard (Ragard, 2018), G. Gable, D. Sedera, & T. Chan (Gable et al., 2008) [10] Gaskell (Gaskell, 2009) [11] S. Ghosh, J. Nath, S. H. Agarwal, A. Nath (Ghosh et al., 2012) [12] E. B. Mansour, D. Mupinga (Mansour & Mupinga, 2007) [13] Tomsic, A., & Suthers, D. (Tomsic & Suthers, 2006) [14, 15] and others have highlighted the positive impact of digital education on students' skill development. These authors emphasize that digital learning enables students to leverage individualization, interactivity, visualization, and gamification in their studies. Moreover, it opens up significant opportunities for education management through artificial intelligence and big data, allowing for the analysis of learning outcomes and challenges.

This digital transformation in the education industry is not limited to learning and teaching. What's all the major aspects of digitization in the education sector, upcoming trends, and strategies that will help enhance the overall student and teacher experience.

In education, digital transformation can enhance the experience of learners, mentors, and alumni and help in institution management. It helps provide:

i) A seamless enrollment experience for students;

ii) An interactive and engaging learning experience;

iii) Better learning outcomes;

iv) Flexibility to continue learning and teaching from a remote location;

v) Flexible course structure and allow students to learn from any device, anytime;

-vi) Administer student performance;

vii) Seamless school/college/university administration.

The term "*digitalization in education*" encompasses all forms of teaching and learning enhanced by the use of digital technologies, whether fully online (both synchronous and asynchronous), hybrid, or blended teaching and learning activities.

Numerous studies have delved into the specificities of technology-based education, with their categorization carried out using the Delphi expert evaluation method (Zawacki-

Richter, 2009) [16]. Within the research framework, three levels of classifying research topics in the realm of technology-based education have been identified:

i) Macro Level: This encompasses broader systems and theories, including access, equality, and ethics; globalization of education and cross-cultural aspects; educational systems and institutions; theories and models; as well as research methods and knowledge transfer;

ii) Meso Level: Here, the focus shifts to management, organization, and technologies, encompassing areas such as management and organization; costs and benefits; educational technologies; innovations and changes; professional development and supervision; student-support services; and quality assurance;

iii) Micro Level: At this granular level, the research zooms in on teaching and learning specifics, including pedagogical design; interaction and communication in educational communities; and the characteristics of trainees.

These three levels, with the corresponding classes of research directions, comprehensively describe and position all research and publications.

Vietnam, like many other countries, recognizes the importance of digital transformation in the education sector. At the national policy level, the Vietnamese government has taken significant steps to promote and implement digital transformation in school education. Several key strategies and initiatives have been introduced to leverage technology for enhancing the quality of education and preparing students for the digital age:

i) Integration of Information and Communication Technology (ICT) in Education: The Vietnamese government has emphasized the integration of ICT in education curricula. This involves equipping schools with necessary technological infrastructure, providing internet connectivity, and ensuring that teachers and students have access to digital devices.

ii) Development of Digital Learning Resources: Efforts have been made to develop and distribute digital learning resources, including online textbooks, educational apps, and interactive multimedia content. These resources enhance the learning experience and make education more engaging for students.

iii) Teacher Training and Capacity Building: Training programs are conducted for teachers to enhance their digital literacy skills and equip them with the knowledge to effectively integrate technology into their teaching methods. This ensures that teachers are comfortable using digital tools and can effectively impart digital skills to students.

iv) Promotion of E-Learning Platforms: E-learning platforms and Learning Management Systems (LMS) have been promoted to facilitate online learning. These platforms enable students to access educational materials, submit assignments, and interact with teachers and peers online.

v) Focus on STEM Education: There is an emphasis on Science, Technology, Engineering, and Mathematics (STEM) education to prepare students for careers in technology-related fields. Specialized STEM programs and digital labs are introduced to nurture students' interest and skills in these areas.

vi) Data-driven Decision Making: The government promotes the use of data analytics in education. Analyzing data related to student performance, attendance, and other factors helps in identifying areas of improvement and tailoring educational strategies to individual student needs.

vii) Cybersecurity Measures: Given the increased use of technology, there is a focus on implementing robust cybersecurity measures to protect students' data and ensure a safe online learning environment.

viii) Public-Private Partnerships: The government encourages partnerships with private technology companies to develop innovative solutions, provide resources, and support various digital education initiatives.

ix) Community Engagement: Efforts are made to involve parents and local communities in the digital education process. Workshops, seminars, and awareness campaigns are

conducted to educate parents about the benefits of digital education and how they can support their children's learning at home.

3. Research Methods

The main research method used in this study was a comparative analysis of publicly available data on the digital transformation of education in Vietnam. The data analyzed included scientific and educational articles, official websites of state ministries, strategic national programs and projects in the field of digital transformation of education, open statistics of digital learning platforms, services, and websites of educational institutions. The additional research method was studying the learning content and tools of digital learning platforms and services available to registered users.

4. Findings

4.1. The National Policy Level in Vietnam Carry out Digital Transformation of School Education

Vietnam's digital transformation policy in education has become a pivotal initiative in enhancing the quality of education and ensuring equitable access to learning. The Vietnamese government has implemented crucial strategies to integrate digital technology into the national education system, maximizing the benefits of the Fourth Industrial Revolution.

One of the primary objectives of the digital transformation policy is to improve the quality of teaching and learning. By incorporating technology into the teaching process, educators can utilize online educational resources, teaching software, and interactive learning applications to create diverse and enriching learning environments. Students have the opportunity to access knowledge flexibly and engagingly, enhancing their motivation to learn and understanding of the subjects.

Additionally, the digital transformation policy facilitates improved access to education for all students, including those residing in rural and mountainous areas. Digital technology helps bridge regional gaps by offering online courses, remote teaching, and educational materials accessible via the internet. This not only expands educational opportunities for students in remote regions but also enables them to access the latest knowledge and information from the global educational community.

The policy also establishes criteria to ensure that teachers are adequately trained and supported to use technology in their teaching practices. The government provides training programs and technical support to help educators master the necessary tools and skills. Furthermore, teachers are encouraged to innovate in applying technology to their teaching methods, fostering the creation of new and engaging teaching approaches.

Vietnam's digital transformation policy in education also creates opportunities for researchers and technology developers to contribute to the field of education. Research projects and the implementation of new technologies are encouraged and financially supported, fostering a dynamic environment for the development and testing of technological solutions in education.

In the context of the digital transformation policy, ensuring the security of information and data becomes paramount. The government and educational organizations need to ensure that students' and teachers' data is securely protected, mitigating any risks associated with technology use. This comprehensive approach to digital transformation not only enhances the educational experience for students and teachers but also paves the way for a technologically advanced and secure educational landscape in Vietnam. As of our last update in October 2023, Vietnam has been actively pursuing digital transformation in its education sector through various policies and initiatives. Please note that specific details may have evolved since then. Here's an overview of the particular national policies that were being implemented in Vietnam to carry out digital transformation in school education:

Table 1. The national policies of digital transformation in school education

No	NATIONAL POLICIES	AIMS
1	The project "Enhancing the Application of Information Technology and Digital Transformation in the Education and Training Sector for the Period 2021-2025 and Orientation to 2030" [17].	Aims to establish a policy framework, outline key tasks, and propose solutions to implement information technology and digital transformation in the education sector by 2025 and toward 2030.
2	The Ministry of Education and Training's Plan to Enhance the Application of Information Technology and Digital Transformation in the Education and Training Sector for the Period 2022-2025 [18].	This plan provides an overall roadmap, specifies key tasks and solutions, and assigns units within the Ministry to lead the organization and implementation of the directives, strategies, and instructions from higher authorities regarding digital transformation in education (currently, the Ministry of Education and Training is implementing information technology and digital transformation according to this plan).
3	Circular on Regulations for Educational and Training Database [19].	This circular aims to create a legal framework for managing, constructing, developing, exploiting, using, and maintaining educational and training database systems, promoting digital transformation in education management and administration.
4	Circular on Management and Organization of Online Teaching in General Education and Continuing Education Institutions [20].	This circular establishes a legal framework to organize online teaching in secondary education, building on the achievements of online teaching in response to the COVID-19 pandemic, and effectively applying modern technology to innovate in teaching content and methods.
5	Project "Implementation of Urgent Tasks and Solutions to Support Online Teaching and Television-based Teaching in the Education Sector for the Academic Year 2021-2022" [21].	This project serves as the foundation for the Ministry's units to implement effective solutions to support the education sector in organizing and managing online teaching.
6	Decision on Data Standards for the Education Sector [22].	This decision aims to implement unified and synchronized management of education institutions nationwide, ensuring consistency and dynamism in data and enhancing the efficiency and effectiveness of education management systems.

Source: Information Technology Department, Ministry of Education and Training, Vietnam -MOET.

4.2. Basic Construction of the Education Sctor Database has been Completed

A database for preschool and high school education has been established, with information collected from 100% of the schools (nearly 53,000 schools), including:

i) 1.6 million profiles of teachers and administrators;

ii) 24 million records of students' academic results, physical health (height, weight, eye and bone conditions, nutrition, etc.);

iii) Integration (API) with over 17,083 schools;

iv) Integration with the national population database (2022): verifying identities for over 23 million profiles, enriching the national

population database with data from more than 20 million citizens.

(Source: Information Technology Department, Ministry of Education and Training, Vietnam -MOET).

4.3. Implemented Project 06 and Achieved many Results

Connecting to the national population database (since 2022): synchronization and verification of identities for over 24 million student and teacher profiles have been completed, achieving an accuracy rate of nearly 98%. The data of nearly 23 million student and teacher profiles have been enriched with educational information for the national population database. MOET (Ministry of Education and Training) is one of the earliest agencies to successfully synchronize and integrate data with the national population database.

Strictly adhering to the timely policy of not using household registration books and not requiring Certificates of Permanent Residence in the implementation of administrative centers (Decree 104/2022), the education sector has connected and utilized citizens' permanent residency history data from the national population database. In 2023, the education sector ceased using Certificates of Permanent Residence, transitioning.

Perform essential administrative procedures online:

i) Candidates register for the National High School Graduation Examination online on the National Public Service Portal (reaching 93% annually);

ii) Candidates apply for university admissions online (more than 600,000 candidates with over 3 million choices registered online each year);

iii) Candidates make online payments for university admission fees on the National Public Service Portal (achieving a 97% success rate);

iv) Candidates confirm their enrollment in universities online through the Admission Portal (reaching 81%);

v) Result: The Ministry of Education and Training (MoET) received the "Excellent State Digital Transformation Agency" award at the Vietnam Digital Award in 2022.

(Source: Information Technology Department, Ministry of Education and Training, Vietnam -MOET).

4.4. Implementing Digital Transformation for the Academic Year 2023-2024

Maintain and maximize the benefits of Learning Management Systems (LMS) in connecting schools, teachers, and students (and parents) for organizing educational activities; ensure integration, connection, and data exchange between online teaching software and educational management software at educational institutions.

Enhance the development of digital learning materials (including electronic lectures, multimedia digital learning materials, electronic textbooks, simulation software, and other learning materials; develop an online question bank system for various subjects) to contribute to and effectively utilize the Ministry's Shared Learning Resource Bank in organizing teaching and assessments.

Promote regular online assessments; conduct computer-based exams for periodic assessments in places where necessary, ensuring proper organization (requires planning and determining implementation steps from pilot implementation to appropriate and effective nationwide deployment).

Efficiently implement the electronic library system, including library management software and a digital database of books and resources for educational purposes. Establish seamless connections with digital learning repositories and facilitate the sharing of digital resources among educational institutions, educational administrators, and teachers.

Review, invest in, and procure additional computers for computer science education to ensure a minimum basic level (Level 2) of computer availability for teaching computer science, for primary schools, a minimum of 2-3 students share one computer; lower secondary schools must have a minimum of 2 students sharing one computer; upper secondary schools

ensure one computer per student. Focus on building studio rooms (equipped with computers and supporting devices for creating digital learning materials and electronic lectures) to support the digital transformation in teaching.

Continuing Effective Online Public Services and Cashless Payments in Education

Continue the efficient implementation of online public services and promote cashless payments in education, with priority given to certain services:

i) Online registration for high school graduation exams through the National Public Service Portal and online registration for university admissions through the National Public Service Portal, both at a comprehensive level;

ii) Partially online services for the admission of first-year students and online services for diploma and certificate recognition, moving toward comprehensive implementation;

iii) Enhance online payment methods for tuition fees and other charges, promoting cashless transactions. Integrate financial management software of educational institutions with cashless payment platforms.

(Source: Information Technology Department, Ministry of Education and Training, Vietnam -MOET).

Technical infrastructure issues can indeed pose significant challenges to effective online teaching.

Assessment of Existing Infrastructure:

i) Conduct a thorough assessment of the current technical infrastructure, including hardware, software, and network capabilities;

ii) Identify weak points, such as outdated equipment, inadequate bandwidth, or unreliable connectivity;

iii) Investment in Infrastructure:

Allocate resources for upgrading hardware, such as computers, tablets, and peripherals, to ensure they meet the requirements for online teaching.

Invest in software solutions that facilitate online collaboration, content delivery, and assessment.

Enhance network infrastructure by improving internet connectivity, increasing bandwidth, and implementing robust Wi-Fi coverage.

Technical Support and Training:

Provide comprehensive technical support for teachers, students, and staff to troubleshoot issues related to hardware, software, and connectivity.

Offer training programs on how to use online teaching platforms, video conferencing tools, learning management systems (LMS), and other relevant technologies effectively.

Establish a helpdesk or support hotline to address technical inquiries and provide timely assistance.

Backup and Redundancy:

Implement backup systems and redundancy measures to minimize disruptions during online classes.

Have contingency plans in place for power outages, internet outages, or other technical emergencies.

Explore cloud-based solutions for storing and accessing instructional materials, ensuring continuity of teaching and learning activities.

Accessibility and Equity:

Ensure that the technical infrastructure is accessible to all students, including those with disabilities or from disadvantaged backgrounds.

Provide support for students who may lack access to necessary technology or internet connectivity at home, such as loaner devices or subsidized internet plans.

Collaborate with community organizations or government agencies to bridge the digital divide and promote equitable access to online education.

Regular Maintenance and Updates:

Schedule regular maintenance activities to keep hardware and software systems up-to-date and functioning optimally.

Monitor network performance and address any issues proactively to prevent downtime or disruptions.

Stay informed about emerging technologies and trends in educational technology to continuously improve the technical infrastructure.

By addressing these specific challenges related to technical infrastructure, educational

institutions can create a reliable and conducive environment for effective online teaching, and learning.

5. Conclusion

In conclusion, the paper has delved into the critical aspects of digital transformation policies in the educational sector, focusing on practical experiences in Vietnam. Through a comprehensive analysis of various strategies and implementations, it becomes evident that embracing digital transformation is not just an option but a necessity in the modern educational landscape.

Vietnam's experiences in implementing digital transformation policies provide valuable insights. The integration of technology in administrative procedures, teaching methods, and student assessment has significantly enhanced the efficiency and effectiveness of the education system. From the establishment of online platforms for exam registrations and university admissions to the development of digital learning materials and electronic assessment methods, Vietnam has showcased remarkable progress.

Additionally, the emphasis on online public services and cashless payments has streamlined administrative processes, making education more accessible and convenient for both students and parents. The integration of digital databases, electronic records, and online communication channels has further facilitated a seamless flow of information among educational institutions, administrators, teachers, and parents.

However, challenges remain, such as ensuring equal access to digital resources and overcoming infrastructural limitations. Continuous investment in technology, training programs for educators, and public awareness campaigns are imperative to address these challenges.

In essence, Vietnam's practical experiences in digital transformation policies underscore the importance of strategic planning, stakeholder collaboration, and adaptability. As the world rapidly advances in the digital era, the lessons from Vietnam serve as a guiding beacon for other nations striving to enhance their education systems through technology. By learning from these experiences and adapting policies to suit their unique contexts, countries can pave the way for a future where education is not just imparted but truly transformed through the power of digital innovation.

6. Recommendations

Creating digital transformation policies in education for Vietnam involves considering the country's specific context, challenges, and opportunities. Here's a framework for developing such policies:

Assessment of Current Landscape:

Conduct a comprehensive assessment of the current state of digitalization in education in Vietnam.

Identify existing infrastructure, resources, and capabilities, as well as gaps and areas for improvement.

Consider factors such as internet penetration, access to devices, digital skills among teachers and students, and the availability of educational content and platforms.

Stakeholder Engagement:

Engage stakeholders from various sectors, including government agencies, educational institutions, industry partners, teachers' associations, parents, and students.

Seek input and feedback from stakeholders to understand their needs, priorities, and concerns regarding digital transformation in education.

Foster collaboration and partnerships among stakeholders to leverage resources and expertise.

Policy Framework Development:

Develop a clear policy framework that outlines the vision, goals, and strategies for digital transformation in education.

Define key objectives such as enhancing access to quality education, promoting digital literacy and skills development, improving teaching and learning outcomes, and fostering innovation in education.

Establish guidelines and standards for digital infrastructure, content development, teacher training, student assessment, and data privacy and security.

Align digital transformation policies with broader national development goals and strategies.

Infrastructure Development:

Allocate resources for upgrading and expanding digital infrastructure in schools and educational institutions.

Ensure reliable internet connectivity, sufficient bandwidth, and access to computing devices for teachers and students.

Invest in digital learning resources, educational software, and online platforms that support interactive and personalized learning experiences.

Capacity Building and Professional Development:

Develop training programs and professional development initiatives to build the digital skills and competencies of teachers, administrators, and other education stakeholders.

Provide training on using digital tools and technologies for teaching, learning, administration, and communication.

Foster a culture of continuous learning and innovation in education through networking, collaboration, and knowledge sharing.

Monitoring and Evaluation:

Establish mechanisms for monitoring and evaluating the implementation of digital transformation policies in education.

Define key performance indicators (KPIs) and benchmarks to assess progress and impact.

Collect data and feedback from stakeholders to measure the effectiveness of digital initiatives and identify areas for improvement.

Use evidence-based insights to refine policies and strategies over time.

Inclusivity and Equity:

Ensure that digital transformation policies prioritize inclusivity and equity, aiming to reduce disparities in access to education and digital resources.

Address the needs of marginalized groups, including rural communities, ethnic minorities, persons with disabilities, and socioeconomically disadvantaged populations.

Implement targeted interventions and support mechanisms to ensure that all learners have equal opportunities to benefit from digital education.

Sustainability and Scalability:

Design policies and initiatives that are sustainable and scalable in the long term.

Foster innovation and experimentation while considering the scalability of successful practices and models.

Encourage the development of local solutions and partnerships that can be replicated and adapted across different contexts and regions in Vietnam.

By following this framework, Vietnam can develop comprehensive digital transformation policies in education that leverage technology to enhance learning outcomes, empower educators, and build a more inclusive and equitable education system for all.

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