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AI and Digital Transformation in Higher Education: Vision and Approach of a Specific University in Vietnam

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Abstract: The Fourth Industrial Revolution is opening up new opportunities and challenges for all industries, professions, and fields, aiming to bring humanity more optimal tools and services. During the Fourth Industrial Revolution, digital transformation has been one of the most critical problems. Artificial Intelligence (AI) and the Internet of Things (IoT) are two technologies that have the potential to cause the biggest breakout to evolve in the educational domain. In recent years, digital transformation has seen implementation across all sectors, including education, healthcare, agriculture, transportation, and other smart ecosystems. Among those areas, education, especially higher education, is among the most challenging due to the diversity in training programs, duration, and subjects. The Internet of Things makes it possible to create smart and ubiquitous learning environments, while artificial intelligence can completely transform the way we learn and teach. In this paper, we present the digital transformation process in higher education in Vietnam and internationally and analyze some characteristics of Vietnamese higher education in the digital transformation process. Moreover, we present the vision, approach, and challenges to digital transformation at universities of low- and middle-income countries from the perspective of the Hung Yen University of Technology and Education in Vietnam.

Keywords: digital transformation; artificial intelligence; internet of things; higher education; Industry 4.0

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1. Introduction

The course of human history has witnessed four distinct industrial revolutions. The onset of the First Industrial Revolution occurred during the mid-17th century. One of the key elements of the Industrial Revolution was the advancement of steam-powered machinery, which served to augment and supplant manual labour. The initial stages of the Second Industrial Revolution were triggered by the significant expansion of electrical engineering during the early 18th century, wherein electrical energy replaced steam power as the primary source of power. In the 1970s, the widespread adoption of digital computers for data processing and storage ushered in the Third Industrial Revolution, sometimes known as the Digital Revolution. A vast number of services and applications that support the advancement of humanity have been made possible with computers and network technology, which have greatly aided the digital process [1]. But more is required.

Modern society aims to create more intelligent, adaptable, and energy-efficient systems that interact, detect, and respond to unforeseen circumstances in real time. The Fourth Industrial Revolution, commonly known as Industry 4.0, was born as a result [2,3]. The development process of the Industrial Revolution is summarized in Figure 1.

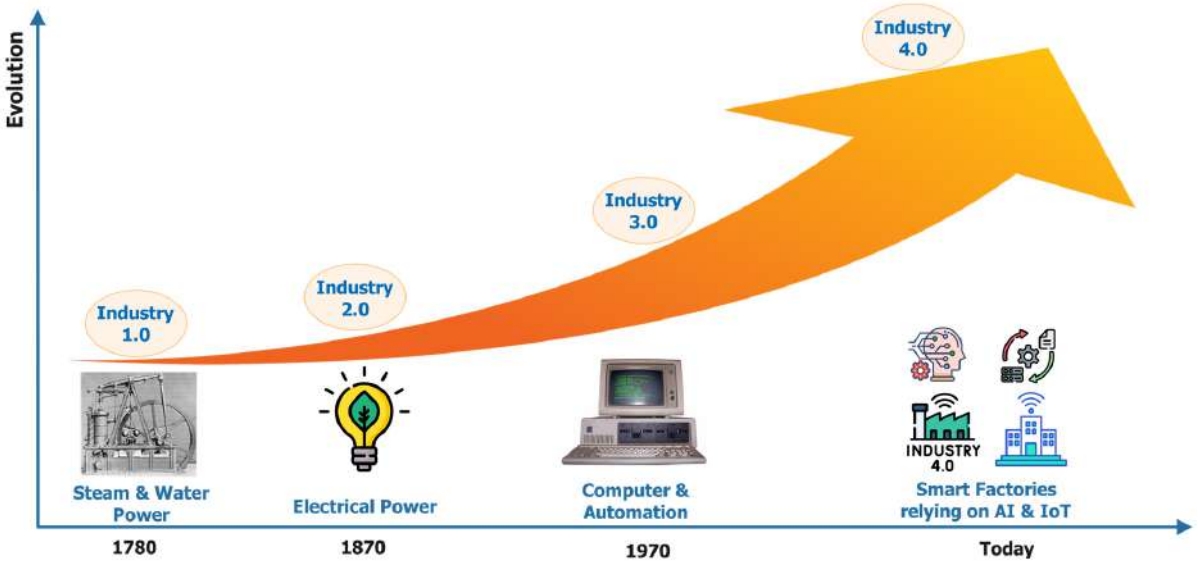

Figure 1. The development history of the industrial revolutions.

The implementation of Industry 4.0 has been shown to enhance productivity and competitiveness in various industries. This transition to a digital economy offers the potential for achieving sustained economic growth at high levels [4,5]. In order to accomplish this, the automation of machine control and production processes is necessary. However, this problem can only be realized via a digital transformation from traditional paper data [6]. Consequently, one of the most important issues for the success of Industry 4.0 is the Digital Transformation (DT) process [7,8]. The DT is happening and will impact all professions and domains, from agriculture to industry [9,10] and education [11]. In general, the DT in education, especially higher education, is one of the most challenging issues due to the diversity in training programs, duration, subjects, and scale of people [12]. The DT of higher educational institutions will directly affect tens of thousands of students and teachers. From a policy perspective, this requires huge resources for investment and upgrading the information technology infrastructure. This is a massive challenge, especially for higher education institutions in low-income countries [13–15].

In the era of big data, using AI and IoT technologies is crucial in fulfilling human learning needs and establishing intelligent learning environments. The communication infrastructure of the Internet of Things facilitates interaction and communication among training institutions, teachers, students, families, and training equipment. This enables the establishment of a lifelong learning environment that is flexible, seamless, and timely, accessible anytime and anywhere [16]. Simultaneously, the implementation of AI technology will impact the methods in which we learn and teach, as stated in reference [17]. This study presents a comprehensive overview of the implementation of emerging technologies in the digital transformation of higher education. Additionally, it outlines the strategies employed for the digital transformation of a particular university in Vietnam.

The main contributions of this study are summarized as follows.

- Clarifying the role, position, and benefits of the DT and how AI and IoT promote digital transformation in higher education;
- Presenting DT in higher education on aspects of contents, benefits, and challenges;
- Showing the vision and approach of the DT for a specific university in a low- and middle-income country such as Vietnam;
- Indicating challenges and positive approaches to drive DT in higher education.

The rest of this paper is structured as follows. Section 2 presents the context of the 4.0 Industrial Revolution regarding characteristics, core solutions, and technologies. Section 3 demonstrates the DT progress. Section 4 shows the digital transformation in higher education. Section 5 mentions efforts to drive DT in Vietnam. Section 6 shows

the vision and approach of the DT at Hung Yen University of Technology and Education (UTEHY), Vietnam, and Section 7 is the conclusion and future works.

2. Industry Revolution 4.0

The concept of Industry Revolution 4.0, namely Industry 4.0, was first mentioned at the Industrial Hannover Fair, Germany, in 2011 [18]. Industry 4.0 is defined as the fusion of technologies that blur the edge lines between physical, digital, and biological. Like the other industrial revolutions, Industry 4.0 has unique features, solutions, and technologies.

2.1. Characteristics

In order to achieve the pre-defined goals, the applications and systems in Industry 4.0 need to be equipped with capabilities such as autonomous, real-time self-communication, intelligence, scalability, etc. In this subsection, we mention some main characteristics of Industry 4.0 [19]. Figure 2 summarizes the main features of Industry 4.0. These characteristics are formed thanks to core solutions and technologies:

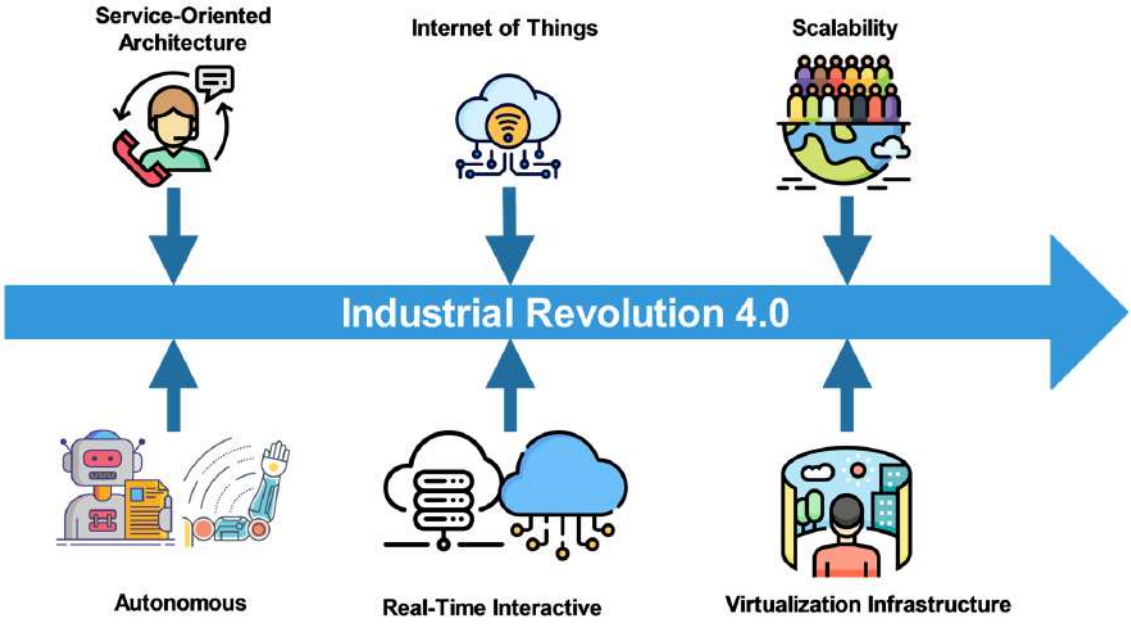

Figure 2. Illustration of key characteristics of Industry 4.0.

- *IoT communication:* The ability to interface and communicate is one of the most prominent features of Industry 4.0. Smart factories, devices, applications, sensors, and people should interact and communicate flexibly and smartly based on IoT communication infrastructure [20].
- *Autonomous*: Industry 4.0 systems should be equipped with abilities such as interacting, exchanging information, recognizing, and decision making autonomously. The authors of [21] introduced an advanced control architecture for autonomous robots.
- *Real-time Interaction:* Industry 4.0 systems allow for the collection and analysis of vast amounts of data to monitor, control, and optimize the handling and real-time decision making. The authors of [22] designed a novel computing architecture for real-time smart healthcare in response to the COVID-19 pandemic.
- *Virtualization Infrastructure*: This provides the ability to design and construct a digital twin system relying on the modelling of physical processes and entities via data handling. It allows Industry 4.0 systems to respond quickly, accurately, and flexibly to various uncertain situations [23,24].
- *Service-Oriented Architecture*: Relying on collected information and the store, Industry 4.0 systems can handle, analyze, and aggregate to create new values and services or business models to enhance the user experience [25].

– *Scalability*: This is one of the main characteristics of Industry 4.0 systems. In the Internet of Things era, there are billions of IoT users and devices joined on the Internet. Therefore, the system should be equipped with flexibility and elasticity ability to adapt to fast-changing organizations and meet the system's scalability [26].

These features of Industry 4.0 are delivered based on its core technologies and solutions aimed at truly intelligent applications and systems, i.e., customized and optimized user requirements.

2.2. Core Solutions and Technologies

Along with the explosive development of IoT applications, the development of Industry 4.0 relies on some of the following breakthrough technologies, as shown in Figure 3:

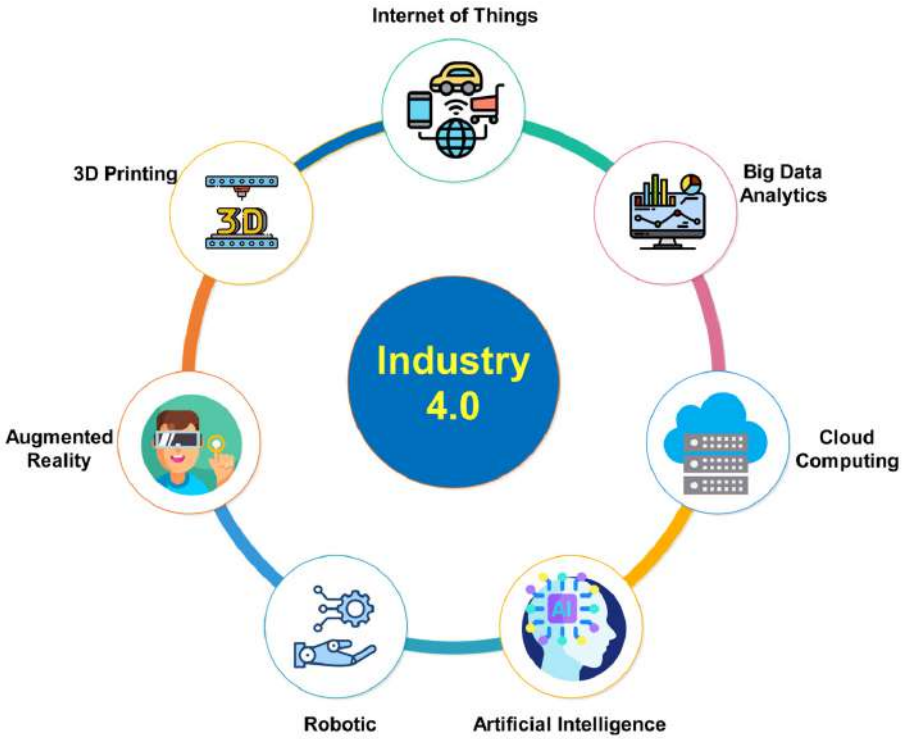

Figure 3. Core solutions and technologies of Industry 4.0.

- *Internet of Things (IoT)*: It is defined as a technology of technologies that allows all things, including devices, applications, solutions, and people, to connect based on the Internet infrastructure. In the future, all devices will be equipped with M2M modules that can automatically establish network connections and communicate with others [27] and be applied in all domains to serve humanity [28].
- *Big Data Analytics*: In Industry 4.0 systems, hundreds of billions of sensors and IoT devices provide a huge amount of data with diverse data types such as text, sound, image, etc. Traditional data processing technologies are infeasible. Big data processing technology allows for analyzing, processing, and creating new services and values [29,30].
- *Cloud computing*: This technology has launched and dominated almost all domains in the past several decades. It allows the provisioning of all things, such as services, from infrastructure and platforms to software [31]. This opens up solutions for businesses to implement infrastructure optimization strategies to save costs and business resources.
- *Artificial Intelligence (AI)*: Industry 4.0 systems are equipped with the intelligence to react and proactively handle situations. Therefore, AI will be one of the most critical technologies of Industry 4.0, as shown in Figure 4. AI, specifically deep machine learning, allows industrial applications and devices to have the ability to self-learn,

analyze situations, and make decisions without human intervention [32]. In higher education, AI can analyze and predict enrollment [33], training occupations, and labour market trends [34]. Moreover, AI can personalize learning and provide study advice to students [35]. In the educational management sector, AI can predict the needs of teachers, materials, and practice equipment and optimize the resources of classrooms, lecture halls, and family connections [36,37].

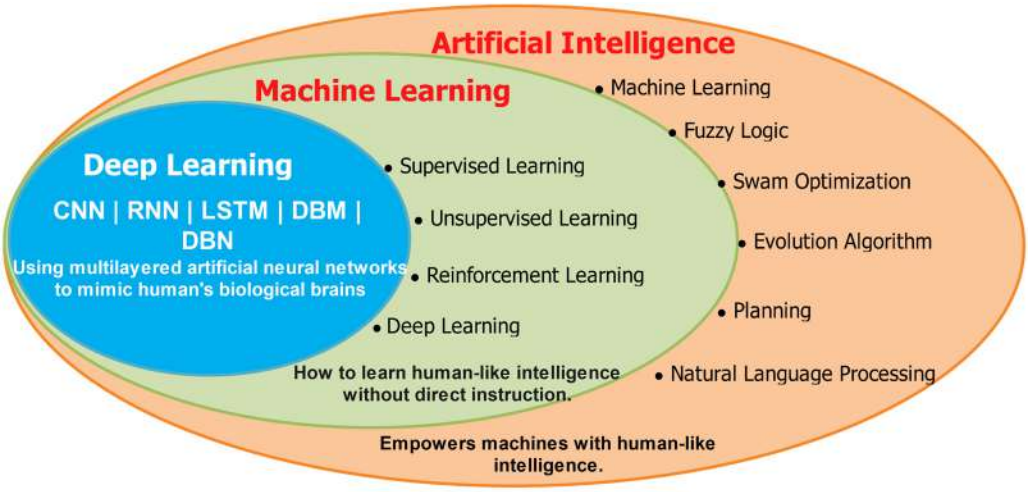

Figure 4. An illustration of AI technique classification.

- *Robotic* is the process of automating activities with robots. The control software of robots is trained using several AI techniques aiming to perform tasks automatically. These robots can replace humans for common tasks such as transaction processing and information system management and play the role of virtual assistants. The authors of [38] introduced an autonomous robotic design to monitor metallic surfaces in an Industry 4.0 environment.
- *Augmented Reality (AR)* combines computer-generated screens, sounds, text, and effects with a user's real-world experience in a virtual environment. AR can be applied in the education sector to create virtual laboratories and virtual classrooms. In [39], the authors presented a comprehensive review of AR technologies on aspects of vision, contributions, architectures, and challenges in the education domain.
- *Three-dimensional printing* technology allows for the creation of 3D physical models of objects. It is commonly used to develop prototypes to shorten the time to market. For example, in the education domain, 3D printing technology allows for building prototype models and devices in the shortest time with high accuracy and low cost. The authors of [40] introduced 3D printing applications in STEM education.

Industry 4.0 is making it easy for organizations to collaborate and share data among customers, manufacturers, and partners in the supply chain. It improves productivity and competitiveness, enables the transition to a digital economy, and provides the opportunity to achieve high and sustainable economic growth. One of the first steps that led to the success of Industry 4.0 is digital transformation.

3. Digital Transformation

3.1. Concept of Digital Transformation

Digital transformation (DT) is the integration of digital technologies into all sectors of an organization, leveraging technologies to fundamentally change the way it operates and its business model, delivering new values to its customers and accelerating business operations [41].

Digital transformation also changes the culture of organizations, requiring organizations to change and experiment with new things constantly [42]. In reality, there is no clear

and specific definition of digital transformation because each domain and organization's digital transformation process is different.

Survey results have demonstrated that digital transformation is an inevitable trend in all social domains, such as government, industry, communication, health, education, etc. The DT in an organization can be divided into two main stages (in Figure 5), consisting of *Digitization* and *DigitalTransformation* [43–45].

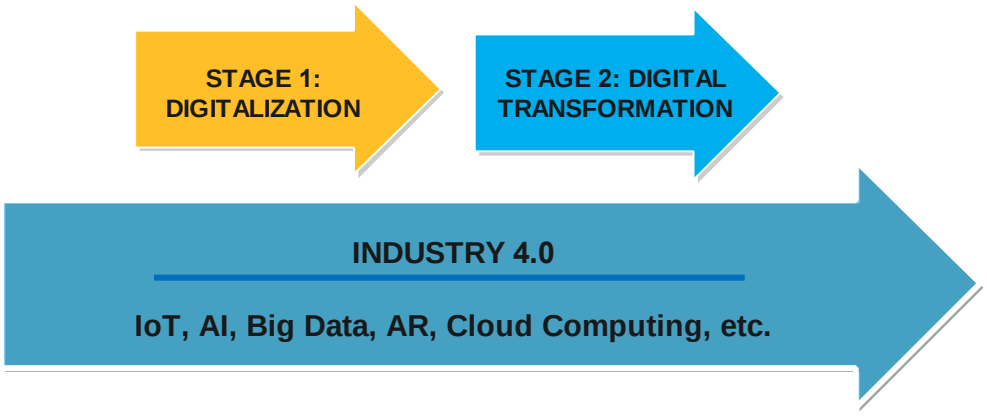

Figure 5. Two main stages of the DT process in an organization.

- *Digitization:* In this stage, the organization converts conventional systems to digital systems such as upgrading information technology infrastructure, transmission Internet lines, security, and network systems, standardizing database systems, and converting paper documents to data files and storage in the information systems database.
- *Digital Transformation:* In this stage, the organizations perform to exploit digitized databases based on advanced technologies to analyze, aggregate data, and create new values. Therefore, *digitization* is the first step of the DT process.

3.2. Benefits of Digital Transformation

According to the reports of well-known market research firms such as IDC [46] and Gartner [47], the benefits of digital transformation extend to all parts of an organization, including management, administration, business, research, and execution.

The most obvious advantages of digital transformation for a company consist of lower operating expenses, longer-term maintained customer relationships, faster and accurate decision making due to real-time provided reporting systems, and improved employee productivity. Consequently, digital transformation increases the operational efficiency and competitiveness of the organization and enhances its value [48].

The digital transformation has an impact on how we interact with others and conduct business. Regarding organizations, digital transformation makes use of data and digital technology to alter business procedures, operational theories, and organizational approaches while also altering the customer experience via services offered by the corporation. Microsoft's report has demonstrated that digital transformation contributed to 15% and 21% labour productivity growth in 2017 and 2020, respectively [49]. In general, the goals of an organization when implementing digital transformation include improving the speed of market research, increasing competitive position in the market, driving revenue growth, increasing labour productivity, and enhancing user experience, as shown in Figure 6.

Leaders increasingly realize the position and importance of digital transformation, which has a decisive influence on the organization's development. A *race* in applying digital transformation in organizations is happening. From a national perspective, the studies of Microsoft have shown that digital transformation increases GDP for countries in the Asia Pacific region by up to 60% by 2021 [50]. While McKinsey's studies have shown that, thanks to digital transformation, the GDP growth of the US could reach 25%, Brazil

about 35%, and Europe about 36% by 2025 [51]. These results demonstrate the importance of digital transformation to nations' economies.

Figure 6. An illustration of the main goals of organizations' DT.

The speed of the digital transformation process in regions and countries is different, depending on the level of technology development and awareness of each organization or country. The region with the fastest digital transformation speed is Europe, followed by the US and countries in Asia.

4. Digital Transformation in Higher Education

4.1. Main Contents

In the general education and training domain and particularly higher education, digital transformation is approached according to the direction that reduces the lecture and knowledge, providing aims to develop the learners' capacity, increasing self-study, creating opportunities to learn anytime, anywhere, personalized learning, creating a learning society, and lifelong learning [52].

The Internet of Things (IoT), cloud computing, Artificial Intelligence (AI), and big data-processing technology explosion are influencing the development of the digital education infrastructure [53]. As a result, many intelligent educational models are being created based on IT applications. These models effectively support personalized learning, where each student follows a different curriculum and method, make it quick and simple to access the vast amount of knowledge stored on the network, and facilitate near-instantaneous communication between families, schools, teachers, and students.

Digital transformation in the education domain can be divided into two main contents: (1) educational management and (2) teaching, learning, assessment and scientific research, as shown in Figure 7.

In the educational management sector, the digital transformation includes digitizing management information, making interconnected big database systems, deploying online public services, and applying 4.0 technologies (AI, blockchain, data analysis) to support management, administration, forecasting, and decision making quickly and accurately [54].

In the teaching, learning, testing, assessment, and scientific research sector, the digital transformation includes digitalizing learning materials (e-textbooks, electronic lectures, e-learning lectures, multi-choice question banks), digital libraries, virtual labs, and deploying online training systems and virtual universities [55].

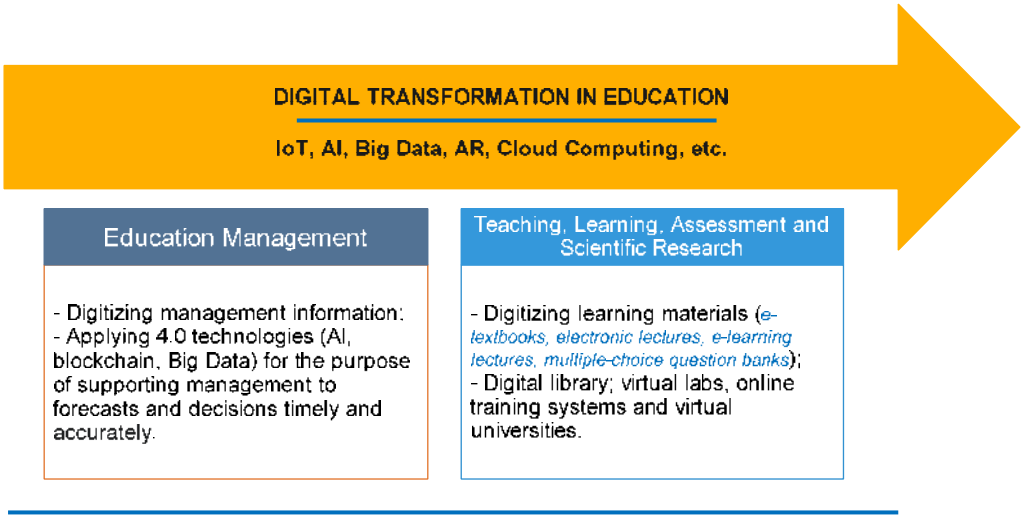

Figure 7. Main contents of digital transformation in the education domain.

4.2. Benefits in Higher Education

Common obtained benefits via the DT of organizations are presented in Section 3.2. In the aspect of higher education, DT is an inevitable trend. Moreover, the emergence and outbreak of the COVID-19 pandemic on a global scale in early 2020 have halted all educational, economic, and social activities. The online learning solutions to cope with the pandemic further affirm DT's meaning and vital role in education [56–58]. DT brings many practical benefits to higher education institutions, as follows.

- Higher education institutions can predict, plan, control, and optimize all issues from human resources, organizational structure, teaching staff, scientific research, international cooperation, and investment in facilities. Moreover, DT can personalize learning and bring real benefits to learners.
- Higher education institutions will have to change their management from traditional methods to the application of information technology solutions based on digitized databases.
- As a result, DT helps universities in their internal governance and supports the state management of the higher education sector. Relying on the digitized database, the state management agencies can analyze to make forecasts and industry and professional orientation and issue practical education policies timely to meet the labour market.
- DT contributes to improving the capacity and quality of training to create a good workforce that participates in all different domains of the economy and aims to realize economic and social goals as well as have the opposite positive effects on the education and training sectors of the country.

5. Digital Transformation in Vietnam

5.1. The Vietnam Perspective

DT is one of the top concerns of organizations in Vietnam. Realizing the importance of DT in Industry 4.0, the Ministry of Information and Communications has developed and submitted to the government for the promulgation of the National Digital Transformation Project in 2020 [59].

DT models in Vietnam also create valuable services for people and effectively use society's resources [60,61]. However, DT also creates conflicts in traditional model-based operating organizations because of making fundamental changes in structure, organization, and personnel. In addition, the maximum application of new powerful technologies is helping startups gain advantages over traditional businesses. Consequently, the context of the current digital economy promotes and requires organizations operating according to traditional models to make breakout changes to continue to exist and develop [62].

With a population of 100 million people and a fast-growing economy, experts have expected that Vietnam has great potential for digital transformation [63]. These are powerful opportunities for Vietnamese organizations to make a breakthrough in the market thanks to the digital transformation process.

5.2. Higher Education Domain

Realizing the importance of digital transformation, the Ministry of Education and Training (MOET) has developed the Project "Strengthening the Application of information technology and digital transformation in the Education and training domain in the period of 2022–2025, toward 2030" and submitted it to the Prime Minister for approval in Decision No. 131/QD-TTg on 25 January 2022, with the goals set specifically to 2025 [64], as follows:

- Give teaching and learning in the digital environment an important, daily educational activity for every teacher and every learner. Ensure that a minimum of 50% of qualified students and teachers (in terms of media, transmission lines, and software) effectively participate in online teaching and learning activities.
- Guarantee 100% of the educational institutions apply the school administration system based on data and digital technology in which 100% of the learners and teachers are managed via digital records with uniform identification on a nationwide scale. Ensure that at least 80% of the facilities, equipment, and other resources for education, training, and research are managed via digital records.

In our opinion, to respond to the strong requirements for DT in the education domain, general higher education and, in particular, higher education institutions need to identify a pioneering mission to perform this task, contributing to shortening the innovation process and improving the quality of education and training. Moreover, promoting DT in higher education institutions is a very important task because it not only affects the education domain but also affects and spreads to all other professions and domains of the economy and society.

5.3. Challenges of DT in Higher Education

Although the many obtained benefits of digital transformation, higher education institutions still face the following challenges, as presented in Figure 8:

- *The legal basis*: the urgency of a complete and synchronous system of legal documents. Policy formulation and promulgation require thorough and scientific research. The need for systems and tools to monitor, manage, and ensure training quality, especially online training. Institutions need to be one step ahead and could be flexibly adjusted to accept new things, such as new technologies, new products, new services, and new models.
- *Changing thinking and management capacity*: Digital transformation affects many different aspects, of which the most direct and most affected are learners, lecturers, management, and administrative staff. In particular, school leaders play personal roles, directing, administering, and organizing the implementation of innovation strategies that need to change their thinking and improve management capacity.
- *Information technology infrastructure*: The information devices should be fully equipped for learners, teachers, higher education institutions, and management agencies. Along with the equipment of hardware devices are unified software applications, compatible and connected platforms, integrated to deploy all activities of the university and the management agencies. In particular, stable and robust Internet connection speed is one of the prerequisites for the success of the digital transformation process.
- *The skills and access capabilities of IT*: Teacher performance is the most important factor that decides the success of online learning and digital transformation. Consequently, teachers need to equip new skills to organize, maintain focus, and engage students in learning tasks and activities.

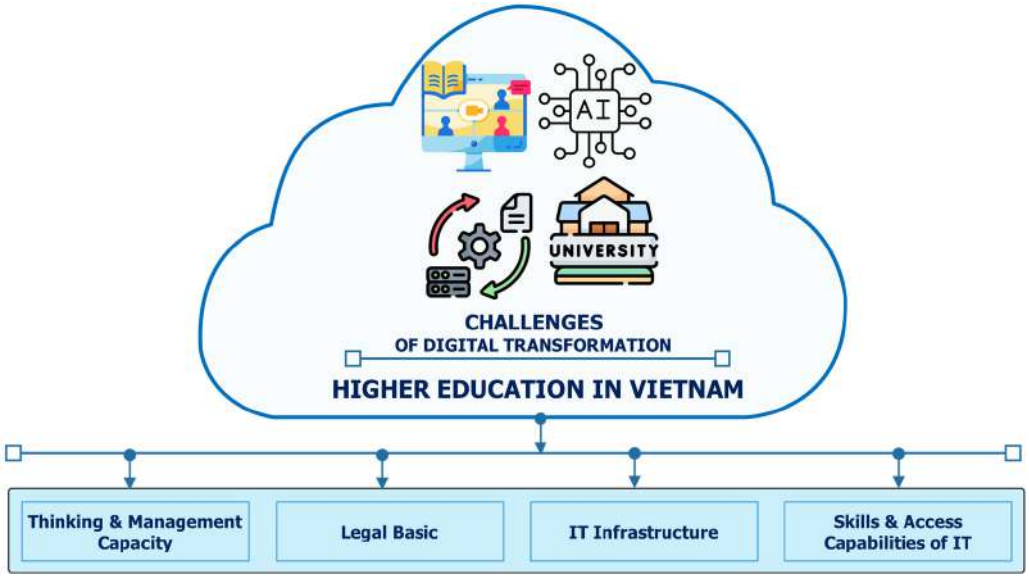

Figure 8. The key challenges of digital transformation in higher education institutions.

The above-mentioned items have shown some of the main challenges of DT in higher education in Vietnam. Besides the common challenges in terms of legality, technology, and solutions, in low and middle-income countries like Vietnam, the DT still has some other challenging issues related to infrastructure investment costs consisting of information technology infrastructure and IT skills and access capabilities. These challenges are highlighted in Section 6, where we indicate the challenges of DT at UTEHY.

6. The Vision and Approach of UTEHY

6.1. Our Vision

In the context of a strong DT trend in the general world and particularly in Vietnam, Hung Yen University of Technology and Education (UTEHY) [65] has approached quickly, turning challenges into opportunities for development. The leadership and pedagogical team of UTEHY have determined that DT is an inevitable and vital trend and the future of higher education. On that basis, UTEHY has built a DT strategy consisting of three stages, each stage lasting three years, as shown in Figure 9.

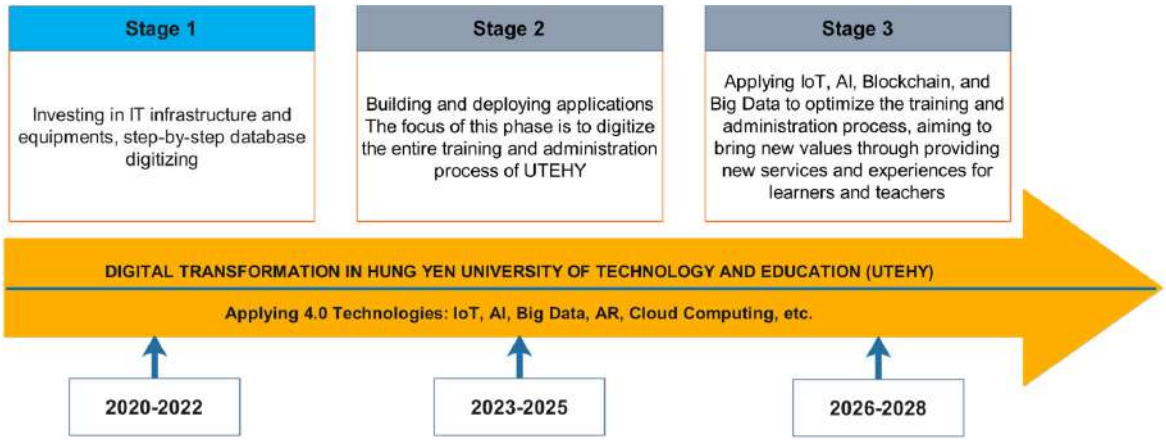

Figure 9. Three stages of digital transformation at UTEHY.

Stage 1 (2020–2022) concerns investing in infrastructure and equipment, step-by-step database digitizing on enrollment, training, timetable, and school administration.

Stage 2 (2023–2025) concerns building and deploying software applications for training management, student management, human resource management, financial management, and enrollment management. The focus of this phase is to digitize the entire training and administration process of UTEHY.

Stage 3 (2026–2028) concerns applying IoT, AI, Blockchain, and Big Data technologies to optimize the training and administration process of UTEHY, aiming to bring new values by providing new services and experiences for learners and teachers. Services include automating and personalizing the learning process, optimizing testing and assessment, and deploying virtual labs.

6.2. Approach and Achieved Results

In order for the digital transformation process to perform according to plan, UTEHY has been approaching the issue from different perspectives and achieved some initial results, as follows:

(1) *The legal basis:* Relying on the circulars and guidelines of the MOET, UTEHY has issued regulations allowing online learning, testing, and assessment. Instructors are encouraged to switch to online teaching for remote classes under certain conditions.
(2) *IT infrastructure:* In 2021, under the supported MOET, UTEHY has implemented a project to upgrade IT infrastructure synchronously, with the granted project value of over USD 1 million. Consequently, 100% of the internal connections to faculties in UTEHY are upgraded with fibre optic systems that reach data rates of 1–10 Gbps. Virtualized server infrastructure and Wi-Fi Internet connection covered 80% of the lecture area.
(3) *Software Applications:* UTEHY has established a completely general database and is focusing on building and perfecting software applications such as E-Library, online learning management system, human resource management, finance management, equipment and material management for practice, etc. The software systems have been deployed, exploited, and improved to ensure the stability of UTEHY's operations in the digital transformation process.
(4) *AI Technology*: Recognizing the importance of AI, UTEHY established an AI research centre right at Stage 1 of the DT process to focus on developing, researching, and fusing AI and IoT technologies to form the completed Artificial Intelligence of Things (AIoT) solutions. Moreover, at the first Stage 2, UTEHY decided to establish strong research groups to invest human and financial resources, aiming to promote rapidly the research and application of AIoT solutions in UTEHY's DT process.
(5) *Human Resources:* Along with upgrading hardware and software infrastructure, UTEHY is gradually improving the capacity of lecturers, experts, and support departments in the digital transformation process. Currently, the university's staff and lecturers have achieved over 40% of doctoral degrees and 100% of master's degrees. This ensures that it is easier to access and deploy new technologies in the DT process.

One aspect that best illustrates the achievements via UTEHT's digital transformation is the scientific research sector. Figure 10 presents the number of published scientific works and projects in the period from 2020 to now. The results show that the total number of published works and projects has an uptrend increasing rapidly every year. The total number of articles and research projects increased by about 1.8 times, from 380 to 680 works. Moreover, the number of works related to emerging advanced technologies also increased over 2.6 times, from 150 to 400 works in the period 2020 to now. These initial results partly represent UTEHY's scientific development strategy. On the other hand, it shows the initial results of the application of advanced technologies in the digital transformation of UTEHY.

The development of UTEHY has been assessed using the University Performance Metrics (UPM) ranking organization with scores awarded 559/1000, reaching level 4 of the total of five levels of the applied universities [66]. Besides the results achieved, the UPM also points out the limitations that UTEHY needs to address and make more efforts to rectify, including Internationalization (9.2/100), Innovation (50/100), and Innovation

Ecosystem (47/100), as presented in Figure 11. In our view, UTEHY needs to strongly promote digital transformation to improve these criteria, thereby improving the overall effectiveness of the education and training activities.

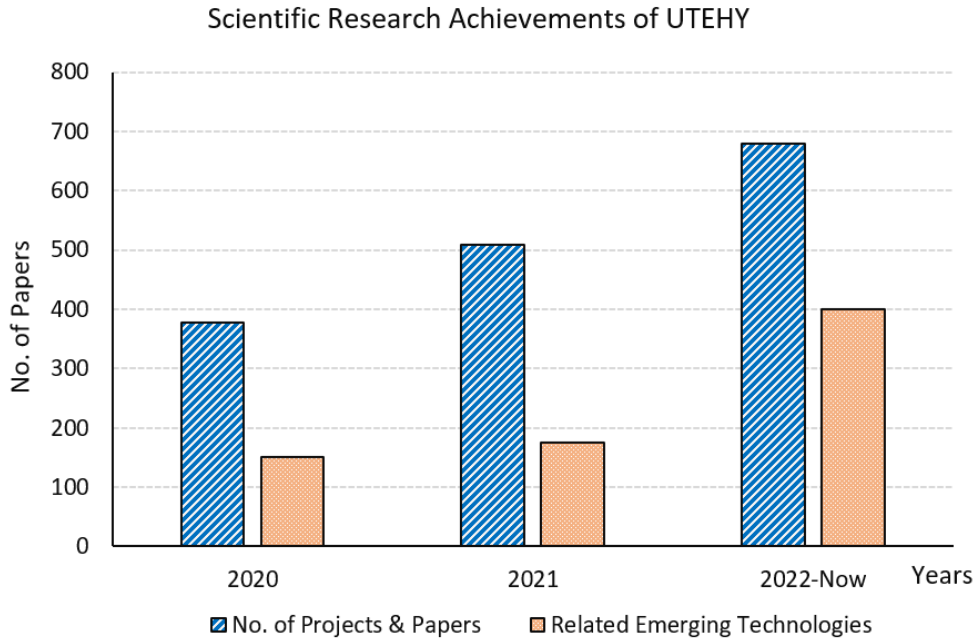

Figure 10. UTEHY's number of performed studies and projects period 2020 to 2023.

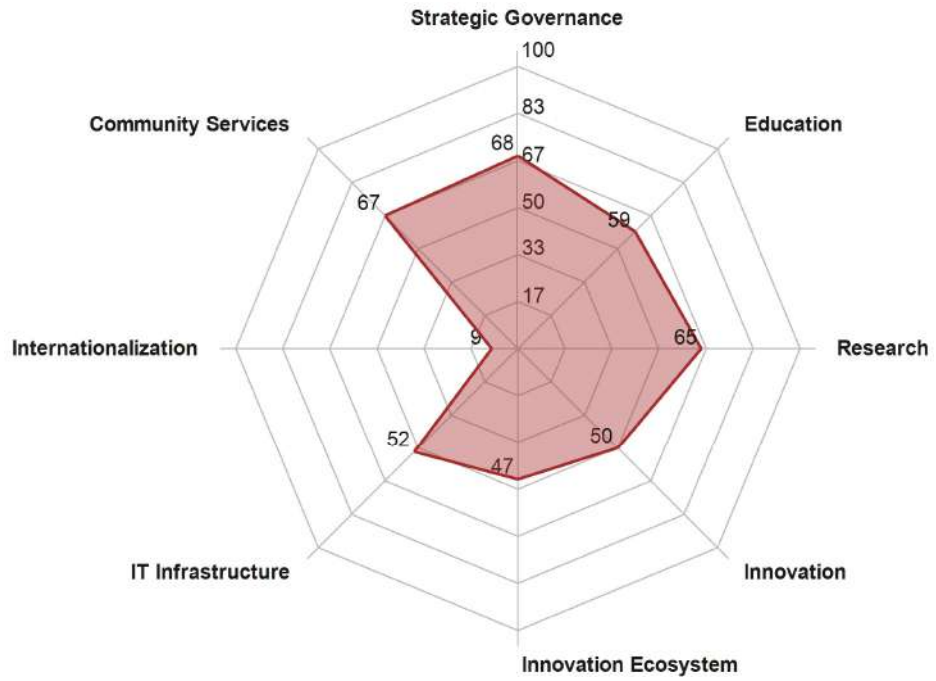

Figure 11. The main rating criteria of UTEHY using UPM.

6.3. Challenges of DT at UTEHY

It should be emphasized again that the success of the digital transformation process strongly depends on many factors, such as investment cost, information technology infrastructure, the synchronization of legal policies, and the determination of the board of directors, the school's pedagogical team, the awareness of learners, and the consensus of the society. It must be acknowledged that these issues are still fragmentary, not supporting

the administration and management, and have not met the increasing requirements of learners. Some typical difficulties in the DT are mentioned as follows:

- About 80% of UTEHY's students come from rural provinces, and economic conditions are not high, so they have not been equipped with computers since the early years. This is a real challenge in the digital transformation processes at UTEHY and general universities.
- The investment cost to upgrade IT infrastructure for digital transformation is very high. This needs support from central agencies and policies to socialize education. Only relying on the tuition revenue of the students will make it difficult for the digital transformation process.
- The licensing and recognition of online teaching and learning as traditional forms should be issued and encouraged by the regulatory authorities. Inadequate awareness and untimely legal documents will slow down the digital transformation process in higher education institutions.

In addition, the construction of virtual laboratories is still quite new, with a large investment budget, so it is not feasible for most higher education institutions in Vietnam. Therefore, this also is a difficulty for the DT process.

7. Conclusions and Future Works

The analysis results have shown the importance and position of digital transformation in the Fourth Industrial Revolution. In the higher education domain, digital transformation is an inevitable trend, a breakthrough, and a big task for higher education institutions relying on two main contents: (1) *educational management* and (2) *teaching, learning, assessment, and scientific research*. Although digital transformation brings many benefits to educational institutions, there are still many challenges in the digital transformation process, including the legal basis, thinking and management capacity, information system infrastructure, and skills to use and access new technologies. This work has also demonstrated that the digital transformation process for higher education requires large investment resources and costs and is an addressed challenge, especially in low-income countries. Moreover, we have considered the digital transformation process of Hung Yen University of Technology and Education (UTEHY), such as a specific university in Vietnam, a low- and middle-income country. Thanks to a flexible and suitable approach to the DT process, UTEHY has achieved some initial results. In our opinion, DT will be the inevitable trend, the future of the higher education domain and education institutions. With the emergence of the COVID-19 pandemic, DT has been a race between higher education institutions in Vietnam as well as around the world. In future works, we will consider the construction of a smart recommendation model to realize the DT process in higher education for low- and middle-income countries.

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