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Research Article

Developing A Conceptual Model For University 4.0 In The Digital Era

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ABSTRACT

University 4.0 is a modern higher education model in association with the Fourth Industrial Revolution - Industry 4.0. The model aims to implement, not only two first missions of teaching and research, but mainly the third one of contributing to the local socio-economic development. This paper focusses on clarifying the core components and implementation conditions of University 4.0 model. Specifically, in the context of digital transformation, the main missions of University 4.0 consist in transferring knowledge, supporting and enhancing the innovation versus the professional world. So, the University 4.0 model should be focus on four core components, including: (i) competencies in education, R&D and innovation, (ii) new learning methods suitable to the digital era, (iii) information and communication technologies associated with the Industry 4.0, and (iv) innovative infrastructure to improve learning processes.

Keywords: Higher education, university 4.0, university 4.0 model, digital era, industry 4.0.

1. Introduction

Higher education is currently confronted with the biggest challenges ever, which are related to the digital transformation in the world. In this context, higher institutions also encounter many difficulties in applying new technologies to their training programs, meeting the needs of learners, ensuring the qualification of graduates in line with the needs of the labor market (Miranda et al., 2021; Ramírez-Montoya et al., 2022; Akimov et al., 2023). Modern higher education take on a third mission of supporting and/or implementing the transformation of knowledge into intellectual property that can be exploited and commercialized in real life (Compagnucci & Spigarelli, 2020). If in the traditional educational model, the two first missions of higher education consist in transferring knowledge or teaching and scientific research, the University 4.0 model is a qualitative transformation for universities, with the aim of fulfilling the third mission of modern higher education, directly contributing to the socio-economic development of the community. On the other hand, this model allows applying, exploiting, and developing the results of the industrial revolution 4.0 within the university context (Hamilton, 2020).

In the digital age, the University 4.0 model emerges as the most suitable and effective approach for higher education, particularly when face-to-face teaching is constrained by the challenges posed by Industry 4.0 (Crosling et al., 2015; Q. Zhao et al., 2022). This research, based on a literature review and our practical experience in higher education, consists in developing a conceptual model for University 4.0 in the digital era. Excluding the introduction and conclusion, we structure the paper into three sections, including the literature

review in the second section, the conceptual model of University 4.0 in the third section, and challenges and recommendations for universities in implementing the University 4.0 model in the fourth section.

2. Literature review

2.1. Evolution of the concept of University 4.0

The history of "University" model associated with the industrial revolutions in the world. University 1.0, which emerged after the first industrial revolution, is a one-way educational model, promoting "owning knowledge", with the focus on management, teaching and knowledge creation. The students passively absorb the knowledge imparted by the lecturer. Therefore, in the University 1.0 model, the lecturer is the center of education, with the mission of identifying and disseminating the necessary knowledge to students (Gueye & Exposito, 2020; Miranda et al., 2021).

University 2.0 emerged in the middle of the 15th century, in which students still learn passively; however, the lecturer, besides the main role of imparting knowledge, takes on acting as a reference source for students. University 2.0 teaches in the form of mass general education with large numbers and more focused training quality; training programs are increasingly standardized (Gueye & Exposito, 2020; Kerroum et al., 2020).

University 3.0 is the recent model of higher education in the age of the Internet and information technology, characterized by rich educational opportunities, inter-institutional and intercultural. In which, university model 3.0 provides knowledge training to meet the needs of society for computers, automation, the Internet, information and communication technology (ICT), and social networks. Multimedia resources, online tools and virtual labs are used in teaching and research. University 3.0 lecturers are considered collaborators to support the process of enriching students' knowledge (Gueye & Exposito, 2020; Miranda et al., 2021).

Currently, University 4.0 emerges as an educational model that takes advantage of digital transformation and technology from the industrial revolution 4.0. University 4.0 moves from the traditional model of lecturer-led to the self-study students. Its aim is to enable students to acquire knowledge and skills that develop throughout life, students should be their best self and chart their own path while learning compulsory subjects of their occupation. The education in University 4.0 is closely associated with intelligent systems, robotics, artificial intelligence, nanotechnology, biotechnology, the Internet of Things, 3D printing and self-driving cars of the industrial revolution 4.0 (Miranda et al., 2021).

By definition, University 4.0 is a new educational model that exploits the potential of digital technologies, taking advantage of the value of connectivity thanks to technology to promote lifelong learning, learning in parallel with working in the context of increasingly rapid improvement of technology to serve society. "*The University 4.0 provides autonomous management of learning processes based on the integration of the physical and digital worlds in order to improve and adapt learning*" (Gueye & Exposito, 2020). In general, University 4.0 is a natural breeding ground, fulfilling the mission of teaching, researching and conducting innovative startup activities, applying and exploiting knowledge in production and business activities, contributing to promoting local socio-economic development. University 4.0 allows students to proactively choose learning knowledge, personalize learning roadmaps, flexible study time, balance new knowledge about technologies and use them in work practice, promptly respond to technology-savvy requirements (Mukul & Büyüközkan, 2023).

Table 1: Evolution of Industrial Revolution and Higher education

Model	**Industry 1.0**	**Industry 2.0**	**Industry 3.0**	**Industry 4.0**
Features	• From the 18th to the 19th century • Mechanization, steam engine	• From 1870 to 1914 before World War I • The production line, the telephone, the light bulb, the phonograph, and the explosion of the internal combustion engine.	• Started in the 1980s and is still going on • Computers, automation, the Internet and information and communication technology (ICT), and social networks.	• Is beginning • Intelligent systems: including robotics, artificial intelligence, nanotechnology, biotechnology, the Internet of Things, 3D printing and self-driving cars.
Model	**University 1.0**	**University 2.0**	**University 3.0**	**University 4.0**
Features	• Promoting "owning knowledge", laying emphasis on management, teaching, and knowledge creation • One-way teaching, prioritizing the convey of theoretical and experimental knowledge to learners.	• Mass general education teaching in large numbers • Standardizing training, focusing on training quality • Majors fragmented into specialized sub-majors.	• Knowledge training to meet social needs • Entrepreneurial university • Digital era: teaching, documenting, researching online.	• Training content associated with industrial revolution 4.0 content • Applying digital transformation and technology from industrial revolution 4.0 in training • Students learning, studying on their own.

So, the activities of University 4.0 are closely intertwined with the concepts of the Fourth Industrial Revolution - Industry 4.0 (Hamilton, 2020). On the basis of Industry 4.0 and the Internet of Things, intelligent tools such as robots and artificial intelligence agent software emerge and gradually replace workers and servicing staff in many fields such as education, commerce, tourism, recreation, healthcare, manufacturing..., by creating a huge challenge for human resources in the recruitment market (Gueye & Exposito, 2020). This is the directional element to change the training program, the University 4.0 model, which enables students to face problems, situations and challenges by learning and developing the most common competencies that they can apply in

their personal lives, careers, and society. In addition, teaching methods at universities are also changed most flexibly with the actual situation. Since applying new technology to practical teaching also encounters certain obstacles, traditional teaching methods are no longer suitable, it is required that universities should propose appropriate training methods. To meet the demand for high-quality labor, good professional competency of the 4.0 labor market, teaching quality is improved by challenge-based learning methods, learning to handle situations through practical problems... (Li et al., 2023)

University 4.0 uses innovative facilities, services and systems to improve the learning process, including the admissions process, the start of a new academic year or exams at the end of the unit of study. The emergence of technology has contributed to the removal of geographical barriers in education, and is one of the main means of maintaining the connection between University 4.0 with lecturers, staff and a large number of students coming from all over the world (Y. Zhao, 2015). Information from the universities is sent to students quickly and instantly, students can study anytime, anywhere and apply technology to learn and share many useful resources (Mukul & Büyüközkan, 2023). At the same time, University 4.0 aims at a learner-centered educational model; students all learn, study about the major they pursue on their own and the lecturer is considered as an instructor. Global higher education institutions thus must change from traditional education to needs-based education in order to continue to exist, in the context of more and more diverse types of students with different learning and studying needs emerging. In this model, the transmission or acquisition of knowledge is in the initiative of each individual student.

2.2. University 4.0 in digital era

Digital transformation represents profound changes in operational activities, organizational processes, capabilities, and others patterns aimed at exploiting the organizational advantages and opportunities offered by digital technology (Perkin & Abraham, 2017). Within universities, digital technology and online resources have become ubiquitous, contributing to the transformation and advancement of administrative management, admissions, as well as teaching, learning methods, and research. Specifically, digital transformation enables universities to engage with students, faculty, scientists, and university partners quickly and efficiently. Online lectures, audio and video recordings are used as teaching materials for various classes at different times. Digital platforms are applied to facilitate communication and interactive engagement between instructors and students, organize learning materials, and assess the quality of online student learning. Digital transformation also promotes the expansion of networking activities and interaction with the business environment, corporate partners, and government agencies. Meetings, negotiations, training programs, and technology transfer sessions can now be conducted on digital platforms, applications, computer programs, and online meetings (Y. Zhao et al., 2021; Mukul & Büyüközkan, 2023).

The current digital context, associated with the environmental transformation resulted from Industry 4.0, influence directly the higher education in evolution to the University 4.0 model (Gueye and Exposito 2020; Q. Zhao et al., 2022), that take advantages in accomplishing the mission of knowledge transfer, specifically:

Firstly, University 4.0 equips students with knowledge and skills that can be applied in digital context, offering students the opportunity to be employed right after graduation. University 4.0 model is associated with knowledge transfer departments such as offices, research and transfer centers, which are equipped with a technology system to access digitized knowledge. University 4.0 provides a high-quality education for students with knowledge and skills to meet the labor needs of the market in a globalized society riddled with challenges but also full of opportunities (Crosling et al., 2015). As technology develops stronger, faster, and more economically, University 4.0 focuses more on training skills to effectively use technology applications to meet the real needs of the world's development.

Secondly, University 4.0 is a place to provide necessary technological knowledge for administrators in the digital era, as an intermediary of high-quality human resources with enterprises in the Industry 4.0. The digital transformation revolution promotes the expansion of exchange and interaction activities with business schools, business partners, and state management agencies. Meetings, negotiations, training programs, technology transfer sessions are now feasible on digital platforms, applications, computer programs and online meetings (Q. Zhao et al., 2022; Wang et al., 2023).

Thirdly, at University 4.0, digital technology and online resources have been widespread in all aspects, contributing to changing and promoting reforms from administrative management, enrollment to activities and methods of learning, teaching and research. Applied digital platforms allow communication and interaction between lecturers and students, arrangement of learning materials, and online student quality assessment. Online lectures, audio and video recordings are used as teaching materials for many different classes, at many different times (Mukul & Büyüközkan, 2023). University 4.0 also easily meets the learning and research needs of many students through online teaching at the most reasonable cost. Technological factors change the educational direction of universities, diversifying student resources of global universities in the current digital era.

Fourthly, University 4.0 creates a multi-dimensional relationship between universities, economic sectors and governments, thereby creating a cycle of training - creative research - application and business exploitation, contributing to socio-economic development in Industry 4.0.

2. Research methodology

3.1. Qualitative method

To conduct research, the interview method is implemented targeting education experts. This method is suitable for our current exploratory research. Firstly, by directly interacting with education experts, we gain a deeper understanding of the trends, challenges, and potential of the University 4.0 model. Feedback and insights from experienced experts in the education field allow us to identify crucial components that may have been overlooked during the research process. Additionally, the interview method provides a more nuanced and comprehensive perspective on issues from the personal viewpoints of each expert. This not only allows us to focus not only on specific data but also to better comprehend the social, cultural, and political contexts in which the University 4.0 model operates. The diversity in perspectives and experiences among experts also establishes a solid foundation for constructing a rational and effective model as it enables us to evaluate and integrate diverse opinions and multifaceted recommendations for the University 4.0 model.

Also, direct engagement with education experts also provides an opportunity to cultivate relationships and collaborative networks in this field. These relationships can not only offer support and guidance throughout the research process, but also lead to long-term collaboration opportunities and promote sustainable development in the context of University 4.0. This underscores why utilizing qualitative methods, particularly conducting interviews with education experts, is an appropriate approach that adds significant value to our current research.

3.2. Interview implementation

To conduct interviews with education experts, we sought out and selected experienced university education specialists with deep knowledge of the education field. A total of 26 experts working in Vietnamese universities and the Ministry of Education and Training of Vietnam were chosen for interviews. During the interviews, we focused on topics such as the development of technology, human-machine interaction in education, organization and management of learning in digital environments, and the roles of teachers and students in University 4.0.

Table 2: Research sample

Type	*Male*	*Female*	*Sum of Total*	*% total*
Domestic education experts	9	13	22	57.89%
Public education management experts	2	2	4	10.53%
International education experts	4	8	12	31.58%
Grand Total			38	100%

Also, to develop a comprehensive conceptual framework in the context of global integration, the important subsequent step is to conduct interviews with 12 international education experts working in Vietnam. These experts may come from leading universities worldwide, international educational organizations, or reputable individual researchers in the field. During the interviews, we need to focus on comparing and analyzing education methods, models, and trends in developed countries, thereby drawing lessons and applications for the educational context of Vietnam.

Based on the information gathered from experts, we developed a conceptual model for University 4.0 in the digital age. This model encompasses components such as core competencies, information and communication technologies, innovative infrastructure, new learning methods. The model should also be highly applicable, reflecting the specific context and needs of the education system in emerging country as Vietnam in the context of global integration.

4. Conceptual model of University 4.0

4.1. Core components of University 4.0

University 4.0 model refers to higher education institutions applying new learning methods, innovative management and educational tools, smart and sustainable infrastructure that integrates new information technology elements. In general, core components of University 4.0 (Miranda et al., 2021) include:

Desirable critical competencies in today's students: As early as the 1990s, competency-based education has had a significant impact on higher education worldwide. By learning and developing the necessary competencies, students can apply knowledge and skills in their personal lives, careers, and social relationships. Therefore, higher education institutions have identified important competencies that need to be taught in higher education, from which to create new learning methods, activities, and tools to train and develop these competencies. Among these, transversal and disciplinary competencies are important competencies as they embrace personal, emotional, social, intellectual as well as related behavioral and knowledge competencies that today's students need to apply and practice in their lives and careers. Specifically:

- Transversal competencies: In the University 4.0, five transversal competencies are identified as core competencies that need to be fostered for learners: (i) Critical thinking, that encourages students to participate

in solving real situations, discuss different problem-solving methods (Jugembayeva & Murzagaliyeva, 2021). (ii) Cooperation, that divides responsibility for each individual and motivates them to contribute, solve common problems/complex projects in a group. (iii) Collaboration, that encourages students, through group activities, to demonstrate their ability to interact with the rest of the members to demonstrate their teamwork ability in collaborative projects. (iii) Communication, that encourages students, through activities, to express their ideas orally, graphically, or in writing, even using any media or technology tools. And (iii) creativity and innovation, that encourage students, through activities, to design, develop and research to realize creative and innovative solutions (Ramírez-Montoya et al., 2022).

- Disciplinary competencies: These competencies are closely associated with specific technical knowledge and task-oriented skills applied in a particular field. It covers three aspects, including: (i) training and developing specialized knowledge, techniques, technologies, and skills for application in the workplace; (ii) capacity to research, design, create and implement new technologies; and (iii) ability to use emerging technologies to propose technology-based solutions (Miranda et al., 2021).

New learning methods: In the University 4.0 model, it is necessary to adjust traditional learning methods so that students can access appropriate learning and training programs, in which priority is given to information technology applications. To develop effective learning methods, the following two aspects need to be considered (Miranda et al., 2021; Ramírez-Montoya et al., 2022; Akimov et al., 2023):

- Learning delivery modalities: Higher education courses and programs are adopted and combined together to provide flexible, accessible, tailored and personalized teaching and learning programs. There are three learning-delivery modalities commonly used in University 4.0 model: (i) Face-to-Face learning is mainly based on active learning, (ii) Online distance learning takes advantage of modern technology platforms so that students can learn remotely, and (ii) Hybrid learning allows students to study anywhere on their own while still interacting with the teacher and accessing the repository of materials and lectures of courses of learning, which enable to optimize learning processes and resources.
- Learning methods: In the University 4.0 model, many new learning methods have appeared with the aim of building a generation of highly capable and thinking students. These methods focus on a student-centered model - a model in which learners can actively participate in the learning process and apply modern technologies to improve the quality of teaching and learning. Innovative learning methods therefore emerge alongside pedagogical approaches, such as case-based learning, learning through practice, or learning through activities/games.

Current and emerging information and communication technologies: The use of IT in the University 4.0 model is becoming increasingly important while the traditional teaching-learning model is transitioning to a student-centered model, encouraging them to develop their individual competencies to adapt to these changes (Miranda et al., 2021). Not only that, IT also allows students and lecturers to interact with each other more easily, helping to improve the teaching - learning process by accessing knowledge anytime and anywhere.

The IT component of the University 4.0 model can be considered in two ways. One is, technology-based, which combines operating principles of technology and engineering to provide solutions, such as artificial intelligence, machine learning, high data processing, data analytics, cloud computing (Akimov et al., 2023). The other is, tools and platforms: in the University 4.0 model, modern IT tools and platforms enable to significantly improve the teaching and learning process in many aspects. For example, web-based technologies handle huge amounts of data and provide such services as email, blog, wiki, and most recently, virtual learning environments. In other words, information and communication technology has opened up opportunities to innovate and improve teaching and learning processes at today's universities.

Innovative infrastructure: Currently, innovative virtual and physical infrastructures have come into existence to meet the needs and solve the current inadequacies in higher education (Akimov et al., 2023). There are two proposed levels to describe the infrastructure currently in use, namely the classroom level and the organizational level (Miranda et al., 2021).

The classroom level mainly considers how well equipped the classroom is, with consideration of furniture, tools connected to educational resources. In addition, attention should also be paid to creating a learning environment since specific design features have a positive effect on student learning spirits. Therefore, pedagogical and psychological studies have shown that learning environments such as classrooms, libraries, etc. can be adjusted with specific architectural style, color, light, sound and temperatures to improve students' learning.

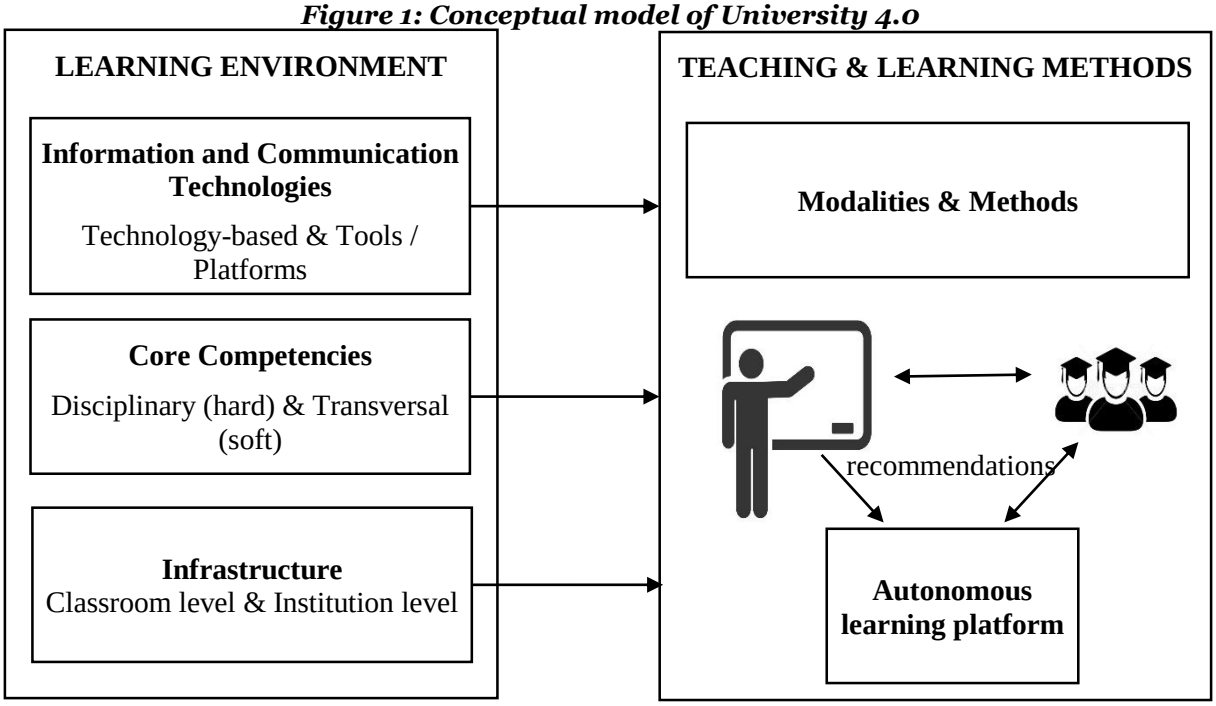
The organizational level focuses on the process of using the institution's infrastructure, services, and systems. This infrastructure is considered not only for teaching and learning, but also for management and associated services. Today, universities provide better infrastructure and spaces for the learning environment, as well as constantly improve it to bring well-being and joy to all members, including lecturers, students, and staff. Therefore, the infrastructure in the University 4.0 model also needs to ensure characters of entertainment, comfort, sustainability, and easy accessibility. In the context of the COVID-19 epidemic, many higher institutions have quickly adopted virtual and digital infrastructures to ensure continuity in distance learning. These infrastructures comprise IT and communication platforms that use connectivity/digitization/virtual capabilities to support online classes. In addition, many services such as online libraries, virtual laboratories, etc. have also been activated and widely used.

4.2. Main activities in University 4.0

The University 4.0 model is operated based on two factors, i.e., educational environment and teaching-learning activities. The educational environment comprises information and communication technology systems, training content, and infrastructure. Teaching-learning activities comprise training methods and self-study foundation. In particular, the educational environment is the basis that influences teaching and learning with the application of new methods and modern technologies (digital/virtual technology) (Gueye & Exposito, 2020; Miranda et al., 2021; Akimov et al., 2023).

Firstly, for implementing the University 4.0 model, it is necessary to have an educational environment 4.0, in which information and communication technology plays a very important role. IT not only enables to modernize the learning process, maximizes the student-centered goal, but also provides a connection environment between teachers and learners, stores a treasure of data, together with solutions to improving teaching-learning efficiency such as data analysis, cloud computing, etc. In addition, IT tools and platforms provide databases and virtual reality learning models that allow training methodological innovation, increase interaction between users to improve teaching and learning efficiency.

Figure 1: Conceptual model of University 4.0



Source: adapted from Miranda et al. (2021), Gueye & Exposito (2020) and Akimov et al. (2023)

Secondly, it is necessary for higher education institutions 4.0 to define training content, which focuses on hard and soft competencies for students so that they have the knowledge, experience and skills that can meet the needs of the work and social lives later. Some important soft skills such as critical thinking, teamwork ability, communication skills, creativity... And the hard skills that training should be focused on for students are specialized knowledge, research ability, and ability to use new technologies.

Thirdly, universities should also equip appropriate infrastructure at both the classroom level and the organizational level to create a healthy, creative and exciting learning environment for teachers and learners. This infrastructure comprises not only equipment for teaching-learning activities, but also appropriate design in terms of color, layout, lighting... to create a positive mood for the people involved.

Only when an educational environment ready for University 4.0 has been established, can teaching and learning activities begin. The educational environment has a significant impact on the training methods. Specifically, IT and communication enable the transformation of traditional teaching methods to learner-centered methods, with more personalized, flexible and accessible curriculum. With modern IT and infrastructure, universities can deploy face-to-face learning, distance online learning, or hybrid learning to meet the needs of learners. Besides that, the training content will also have an impact on the training method. Instead of teaching according to the traditional method, universities can now apply the teaching method through real situations, games, or activities.

Fourthly, in activities of University 4.0, lecturers and students can interact with each other anytime, anywhere thanks to the digital technology platform and strong and convenient connectivity. With a student-centered teaching method, through self-studying platforms, the lecturer acts as a guide, an advisor orienting learners on methods, skills, and ways, as well as answering students' questions. Under this model, students will be empowered to take the initiative in learning, and at the same time encouraged to research and create on their

own. Not only that, through a number of teamwork activities, the University 4.0 model enables students to perfect the skills later required.

The IT and communication application in educational environment creates autonomous learning platforms such as ZOOM, Meets, Webex, M-Teams, allowing students to proactively participate in sessions. Through a digital technology platform and strong and convenient connectivity, lecturers and students can interact with each other anytime, anywhere. Some other autonomous learning platforms for data lookup, such as Big Data, have also become effective tools to support teachers and learners in searching and looking up every day. Thanks to these platforms, learners are more proactive in the learning process; the lecturer's role is also diminished, becoming a counselor and orientator for students. This model enhances autonomous learning capacity, puts learners at the center, promotes study with self-awareness and creativity, as well as trains students in necessary skills. As such, when operating the University 4.0 model, students and lecturers have the opportunity to access modern technology, connect unlimitedly, and improve learning efficiency in the digital era.

5. Challenges for universities and research implications

5.1. Challenges of transition to University 4.0

In a digital context, universities confront many difficulties and challenges when implementing the University 4.0 model.

Firstly, the current training trend in universities is still following the traditional model, i.e. in-depth training, narrow majors, theory-heavy training, not focusing on practice and soft skills. In digital context, universities in developing country, due to insufficient resources and preparation for the University 4.0 model, are still slow and confused in the implementation.

Secondly, the material facilities for 4.0 training at universities in developing country are still insufficient and weak, not capable of serving the 4.0 training model. Many universities developing country do not have enough financial and human resources to equip and operate an information technology system to ensure connection, learning and access to knowledge anytime, anywhere for both teachers and learners. The social situation due to the pandemic has undergone many unpredictable changes, requiring universities to deploy the 4.0 learning model to meet the needs of students in particular and the whole society in general. However, only a few universities have sufficient human and material resources to implement this model.

Thirdly, the autonomous and creative learning capacity of students in developing country is still limited, thereby affecting the effectiveness of the 4.0 teaching and learning model. Most students are still accustomed to traditional teaching and learning methods, in a passive manner, with little practice, lacking the necessary soft skills to adapt to new training models and methods. The digital transformation has also substantially affected the teaching-learning spirits of lecturers and students. Many students do not have the intention to learn with self-awareness, making the distance learning model ineffective.

Fourthly, innovative thinking on teaching and learning methods according to the University 4.0 model of university leaders has not been thoroughly grasped yet. There are still many leaders who are afraid and hesitate to innovate due to insufficient funds and human resources. This mentality causes many universities not to make positive and decisive moves when switching to a new training model. In addition, the digital transformation obliges many universities to cut down expenses and operate cautiously, therefore unable to immediately deploy this model.

5.2. Research implications

Firstly, to reform training methods and models at universities developing country towards modernizing, adapting to the digital context and catching up with the socio-economic development progress of the country. Universities should create learner-centered training programs, with the focus on skills, increase practice time so that students have more knowledge and practical experience. The training content is closely associated with reality, less theoretical. Teaching methods need to be more diverse, enabling students to promote critical, active, proactive thinking, and a spirit of cooperation and work in team.

Secondly, universities developing country should be more active and proactive in cooperating with businesses to increase investment funds for schools, so that they can equip more machines and tools, creating a standard 4.0 learning environment. This cooperation relationship will bring benefits to both sides, as universities have more financial resources to invest in machinery and information technology systems, recruit high-quality human resources to operate this system; and businesses will benefit from quality output human resources to meet work requirements.

Thirdly, there should be training courses for both lecturers and students, to help them adapt well to the learning model 4.0 in the digital context. For lecturers, it is necessary to organize training courses on new teaching methods, applying information technology, virtual reality in curriculum development, interacting with students, etc. For students, it is necessary to have introduction and talk sessions to arouse the spirit of learning with self-awareness, and also guide them on how to make the most of virtual resources, how to use software and information technology applications in the learning process.

Fourthly, universities should actively learn experiences from University 4.0 models of advanced countries in the region and the world, such as Singapore, Japan, South Korea, and countries in Europe, America ... who have successfully deployed the University 4.0 model in the digital context. This is also an opportunity for

university leaders who are still hesitant to exchange more information, thereby being brave enough to innovate teaching and learning methods to meet educational needs in the new situation.

6. Conclusion

Deploying the University 4.0 model is necessaire for universities in the digital context. In order to implement this model, universities need to ensure four factors: capacity (training and developing important hard and soft competencies needed by students), learning methods (combining new learning methods), information and communication technology (implementing current and emerging technologies), and infrastructure (using innovative, modern facilities, services and systems to improve teaching and learning processes). In this, information and communication technology, training content (hard and soft competencies), and infrastructure (at both the classroom and organizational levels) create a favorable educational environment for universities to operate their 4.0 teaching and learning model. In this model, training methods will be diversified, learners-centered, encouraging students' autonomous learning ability, and lecturers will play the role of instructor and advisor for students in the learning process.

Currently, the University 4.0 model has been deployed in many different countries to adapt to the digital context. However, the implementation of this model in developing country faces many challenges when both human and material resources are still weak, failing to guarantee the educational environment 4.0 and digital methods. To overcome these difficulties, universities need should actively cooperate with businesses to have additional financial resources, learn from other universities in the region and around the world to gain more experience. At the same time, lecturers and students should be trained and supported to be able to use tools and software. Proceeding from that, universities will improve the curriculum towards modernizing, putting the learner at the center, strengthening the connection between teachers and learners, and encouraging students' autonomous learning ability.

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