QUALITY OF ONLINE TEACHING AT UNIVERSITIES IN THE CONTEXT OF INDUSTRIAL REVOLUTION 4.0

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Abstract:

Developing an online training method to improve the quality of online teaching in Vietnam is proving to be an appropriate direction and receiving the attention of universities in developing a curriculum framework, meet student needs, and make higher education accessible to more students. This study will provide a theoretical and practical basis for the development of online teaching and the quality of online teaching in universities in Vietnam, thereby proposing solutions to improve the quality of online teaching in Universities in the context of Industrial Revolution 4.0.

Keywords: *Online teaching, University, Industrial Revolution 4.0*

1. Introduction

Recent decades have seen steady growth in online teaching, with institutions offering more courses and programs online (Allen & Seaman, 2013; Allen et al., 2016). Universities have expanded their online teaching services to meet the needs of students and make higher education accessible to more students (Kampov-Polevoi, 2010; Picciano, 2006). Therefore, online teaching method has been popular all over the world and in Vietnam, it is accepted as a new training method with an important role in changing the mindset of educational activities. Chen et al. (2010) asserted that the use of the Internet and information communication technology has become a common practice in all aspects of higher education.

In the context of the industrial revolution 4.0, the construction and development of online training methods to improve the quality of online teaching in Vietnam is proving to be an appropriate direction and receiving attention of universities in developing curriculum frameworks. Universities in Vietnam have initially researched and implemented online teaching since 2002 through the organization of seminars on online training methods. Up to now, a number of training institutions have initially implemented training support software and gave positive results: National Economics University, VNU University of Engineering and Technology, University of Science and Technology,... Most recently, the Informatics

Center of the Ministry of Education and Training has deployed an e-learning portal to systematically provide e-learning information in the world and in Vietnam. In addition, Vietnam has joined the Asia E-Learning Network (AEN) with the participation of the Ministry of Education and Training, the Ministry of Science and Technology, the Ministry of Information and Communications... This shows that the research and application of this type of online training has been interested in Vietnam.

However, when compared with other countries in the world as well as countries in the region, online teaching in Vietnam is only at the beginning stage, this is clearly reflected in the "health" of universities in this time, especially when affected by the Covid-19 pandemic. In the context that most universities do not organize for students to have concentrated learning in lecture halls since the Lunar New Year holiday 2020 until now, instead deploying online teaching to limit mass contact. According to the report of the Ministry of Education and Training, as of March 25, 2020, the country has 92/240 higher education institutions (accounting for 38.3%) that have applied the online training method; in which 79 institutions apply completely online, 13 institutions combine online and face-to-face training. Higher education institutions have started to apply online learning management systems (LMS) capable of managing the process of organizing teaching, learning, online assessment together with online teaching applications such as Microsoft Teams, Google Meet, Zoom, Zalo... In addition, the report also shows that some universities themselves, when implementing their own online training system, have encountered difficulties in information technology infrastructure when the number of students participating in online learning is large. Therefore, studying the quality of online teaching in universities in the context of the industrial revolution 4.0 is necessary and urgent.

This study will provide a theoretical and practical basis for the development of online teaching and the quality of online teaching in universities in Vietnam, thereby proposing solutions to improve the quality of online teaching. Online teaching in Universities in the context of Industry 4.0. The results of the research are also a premise to contribute to the innovation, creativity and improvement of the quality of comprehensive higher education in the future, towards a modern education according to international standards.

2. Method

This study employs qualitative research methods that use secondary data sources. By synthesizing, analyzing to related data and previous research outcomes, the study has theory and practice the development of online teaching and the quality of online teaching in Vietnamese universities, through it proposes solutions to improve the quality of online teaching in universities in the context of Industry 4.0 according to the goals of the study.

3. Results

3.1. The development of online teaching in universities

Human history has been witnessing the evolutionary development of a more civilized human being. That evolutionary development process cannot deny the role of education, because education is the chain of life experience of each civilization. The specific expression of education is teaching, instructing, and guiding in order to pass on to the next generation cultural values, life experiences, scientific and technical knowledge, etc. Classroom teaching has long been considered a traditional form of education. When it comes to the traditional form of teaching, we often picture a classroom that is fixed in one place, with students sitting in the classroom and a teacher standing. However, thanks to the strong development of science and technology in the era of the knowledge economy, people can approach a different form of teaching to meet increasingly diverse learning needs, learners can learn anywhere, anytime, in many circumstances. That is the form of distance learning. With this form, learners and teachers do not necessarily have to be present in the classroom but still actively communicate historical experiences to each other. From these new requirements of learners, the form of distance learning was born. It can be said that the first recorded milestone of distance teaching in the world is teaching the church clergy by mail from 50-60 AD. In modern history the timeline is recorded by Isaac Pitman teaching stenography by mail in England in 1840.

Over the course of the development history, the name of this field has been changed: homeschooling, correspondence learning, extracurricular learning, independent learning and extended learning. All of these involve teaching and learning styles that are appropriate when and where they learn. The form of distance learning was formed with the participation of technologies such as printing technology (learning by letter), radio technology, telegraph etc. to multimedia communication and electronic communication in the 90s of the last century. Television is also a fundamental advantage that has been used in distance learning. The development of a large-scale television network becomes consistent with a classroom model with only one teacher on site and learners in multiple locations. The obstacle to this teaching method is that learners must be ready to learn at broadcast time. Next came the Internet and Web technology, and today e-learning systems and online teaching technologies are asserting their place in the learning environment. Practical distance learning began with the appearance of the "Computer Aided Learning Center" in 1982 in Rindge, New Hampshire, USA - the nation's first online school in the West. From 1994 - 1995, when the Internet became popular from an initial small model of in-house Internet providers, online education really exploded. The benefits of online education are becoming more and more obvious. It is the development of online training technology, the ability to organize a virtual classroom and a virtual learning environment that has gradually disrupted the existence of previous notions that did not really attach importance to distance learning when moving from traditional education to online training with the help of computers, information and communication technology systems. Nowadays, an online degree program can be easily

found from colleges and professional schools. Furthermore, the opportunities from online education are increasing rapidly every day and online degrees have been accepted by employers as usual. And to this day, electronic learning systems (E-learning System) and online teaching technologies (Interactive, Online) are mentioned at almost all levels of education.

In recent years, with the development of online training technology, the ability to organize a virtual classroom and a virtual learning environment (VLE) has gradually disrupted the existence of old concepts that did not really attach importance to distance learning when switching from the traditional education model to online training with the effective help of computers and information and communication technology systems.

According to Thomson NETg, the development wave of E-Learning is divided into the following stages:

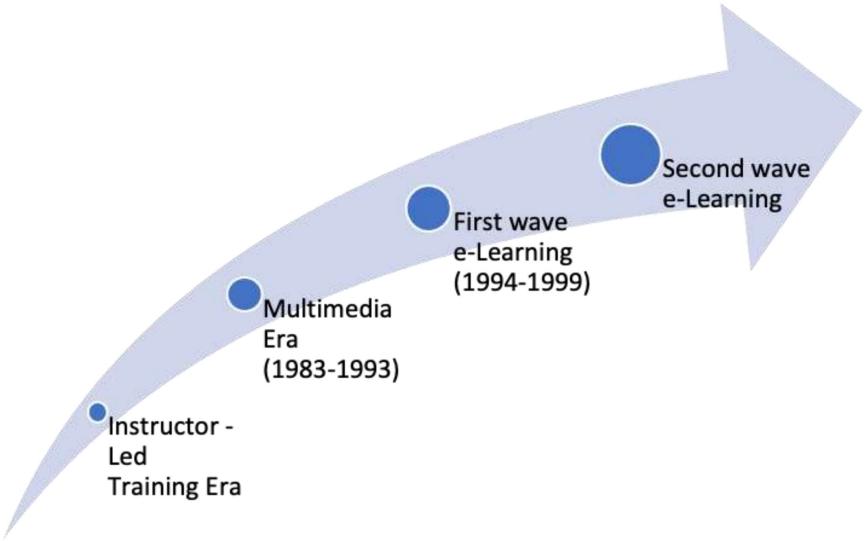

Figure 1: The development wave of E-Learning

- The Instructor-Led training Era (before 1983): Before computers were widely used, the "Teacher-Led training" educational method was the most common method in schools. Students can only exchange focus around lecturers and classmates. The feature of this type is the low cost of organizing training.

- Multimedia Era (1984-1993): Windows operating system, PowerPoint presentation software... These are the basic technologies in the multimedia era. It allows the creation of computer-based audio and visual-integrated lectures using Computer Based Training (CBT) technology that distributes instructional content via CD-ROM or floppy disk. At anytime, anywhere, learners can buy and learn. However, the instructor's guidance is very limited.

- First wave E-learning (1994-1999): When Web technology was invented, education and training service providers began to research how to improve educational methods with

this technology. The wise teacher has gradually revealed through the following means: E-mail, CBT via Intranet with simple text and images, training by Web technology with low-speed moving images has been deployed on a large scale. .

- Second wave E-learning (after year 2000): Advanced technologies and enhanced Internet bandwidth, advanced Web design technologies have become a revolution in education and training to form online training systems. Today, through online training, instructors can provide online instructions (visual, audio, demonstration tools) to all learners, improving the quality of teaching. Day by day, online training technology has proven to be highly effective in education and training, allowing the diversification of learning environments (information exchange, teaching, learning, control, assessment). All of which creates a revolution in education and training with low cost, high quality and efficiency. It was the second wave of online training, and we are in the midst of this wave right now.

E-learning develops unevenly in different regions of the world. E-learning has the strongest growth in North America. In Europe E-Learning is also very promising, while Asia is a region that uses this technology less. In the US, e-teaching and learning has received support and government support policies since the late 90s. According to statistics from the American Society for Training and Development (ASTD), in the US in 2000, nearly 47% of universities and colleges offered different types of distance learning models, creating 54,000 online courses. According to analysts of the International Data Corporation (IDC), by the end of 2004, about 90% of US universities and colleges had launched the E-Learning model, the number of study participants increased by 33% annually in the period 1999 - 2004. E-Learning is not only deployed in universities but also in companies, the construction and implementation also takes place very strongly. There are many companies implementing E-learning instead of traditional training methods and have brought high efficiency. Due to the large market and strong attraction of E-Learning, a series of companies have turned to specialize in researching and building E-Learning solutions such as: Click2Learn, Global Learning Systems, Smart Force…

In recent times, Europe has taken a positive attitude towards the development of information technology as well as its application in all socio-economic fields, especially its application in the education system. The countries of the European Community are aware of the great potential that information technology offers in broadening the scope, enriching the content and improving the quality of education. IDC company estimates that the European E-Learning market will grow to 10 billion USD in the coming years at a growth rate of 96% annually. In addition to actively implementing E-Learning in each country, there are many multinational cooperation between European countries in the field of E-learning. A typical example is the trans-European network construction project - EuroPACE. This is the E-Learning network of 36 leading European universities in countries such as Denmark, the Netherlands, Belgium, the UK, and France, in cooperation with the American E-learning

company Docent to provide courses on the fields such as science, art, and people are suitable for the learning needs of university students, graduate students, and professionals in Europe.

In Asia, E-Learning is still in its infancy, has not had much success due to a number of reasons such as: conservative rules, regulations, bureaucracy, traditional training preference of Asian culture, language heterogeneity, poor infrastructure and backward economies in some Asian countries. However, these are only temporary barriers as the training demand in the continent is also becoming increasingly unmet as traditional educational institutions force Asian countries to gradually accept the undeniable potential that E-Learning brings. Some countries, especially those with more developed economies in Asia, are also making efforts to develop E-Learning in their countries such as Japan, Korea, Singapore, Taiwan, and China... Japan is the country with the most E-Learning applications compared to other countries in the region. E-Learning application environment is mainly in large companies, manufacturers, enterprises... and used to train employees.

The E-Learning market is growing at breakneck speed and is expanding worldwide. The ability to replace traditional education in some fields is becoming an inevitable trend. Following that trend, it is meaningful to research, build and perfect an online training model to improve the quality of online teaching in the economic sector of universities in Vietnam in the context of the industrial revolution 4.0. theory and practice.

The rapid worldwide growth in teaching has necessitated greater attention to the nature and quality of online in general and in higher education in particular. However, there are few studies that address quality in online programs (Fresen, 2002; Sonwalkar, 2002). Much of the research on distance education prior to 1990 was devoted to understanding the differences between traditional courses and distance learning. These studies have focused on comparing traditional learning outcomes and distance learning methods or student satisfaction (Arbaugh, 2000; Hiltz & Wellman, 1997). Research focuses on gap-specific pedagogical tools and how they can affect learning and quality.

Many studies assessing the quality of Internet-based teaching focus on the difference between distance and traditional classroom instruction. Russel (1997) cites more than 300 studies since 1928 that demonstrate no significant difference between distance and learning tradition. However, Russel's research included various distance learning modalities such as mail, radio, one-way television, and videotape. In addition, the methodologies used in many of the studies are questionable. Russel's conclusions suggest that it may be time to move beyond simply comparing distance learning courses with traditional classrooms and strive to understand whether quality learning occurs in Internet-based or not. Arbaugh (2002) asserted that research on the effectiveness of online learning is still significantly limited.

Online Quality Research: Benchmarks for Success in Distance Education Internet-based, authorized by the National Education Association, the nation's largest professional

association for educational departments, and Blackboard, a leading Internet education company (Phipps & Merisotis, 1999). This study looked at case studies of six colleges and universities that offer Internet-based degree programs. In addition, a thorough review of the current literature on distance education was conducted to identify benchmarks used by other organizations to measure quality and learning. Case studies designed to determine the extent to which the various quality measures identified in previous studies are actually being incorporated into the policies, procedures and practices of training institutions from far away. The results are benchmarks that measure the roles of institutions, administrators, faculty, and students needed to ensure quality in Internet-based distance education.

Two leading organizations in the field of distance education, the American Association for Distance Education (1999) and Pennsylvania State University (in the Innovation Project in Distance Education), have also developed guidelines for distance education. Their instruction addresses issues of learning goals and outcomes, interactive learners, and knowledge and problem-based learning. There is additional research indicating that online program quality must be addressed in course planning and instructional design development (Graham & Scarborough, 2001; Harasim et al., 1995; Li, 2002). Much of this research also highlights the fact that ongoing program evaluation is necessary to identify successes and problems while summative evaluation must be directed to external parties.

The University of Illinois (Chicago, Springfield, and Urbana-Champaign campuses) conducted a year-long faculty workshop to address faculty concerns about implementing technology for instruction (1999). The workshop concluded that high-quality online teaching and learning can be achieved if new approaches are adopted to compensate for the limitations of technology and if teachers strive to create a touch for learners. Issues considered are innovation in teaching, student engagement, interaction, and technical support.

3.2. Quality of online teaching in universities in Vietnam

Online teaching in Vietnam began to appear clearly nearly 30 years ago. Its predecessor is distance training, which is conducted by Voice of Vietnam through radio programs that teach Vietnamese, foreign languages, etc. This form of teaching is just a radio program, but looks at it from the perspective of education and training, this is a new form of teaching implemented in the media technology environment. Invisibly, it has become a form of teaching that has helped millions of Vietnamese people improve their people's intellectual level.

Researches on online training capture research related to "Distance Training", a tool known in the renovation of education and training in our country since the 90s of the century. This term is documented on Government decisions on the establishment of training institutions with distance training functions. Specifically: on July 26, 1993, the Prime Minister issued Decision No. 389/QD-TTg on the establishment of the Ho Chi Minh City Semi-Public Open University, in which Article 2 states "The semi-public open university,

Ho Chi Minh City is a training institution with various types of distance learning, on-the-job training, training at satellite sites… to meet the diverse learning needs of society, contribute to strengthening the contingent of scientific and technical cadres for the country". Following on November 3, 1993, the Prime Minister issued Decision No. 535/QD-TTg on the establishment of Hanoi Open University, in which Article 2 states "Hanoi Open University is a training institution and research with different types of distance learning, on-the-job training to meet the diverse learning needs of society, contributing to strengthening the potential of scientific and technical cadres for the country. These two training institutions have been implementing distance learning systems based on the open source learning management system Moodle (Modular Object Oriented Dynamic Learning Environment) founded by Martin Dougiamas in 1999. These two centers is considered as the core of Vietnam's distance learning system. So far, these two universities have a training scale of about 30-40,000 students/year. After the above 2 universities, by 2012, there were more than 12 universities that were allowed by the Ministry of Education and Training to organize distance learning with degrees.

Along with the rapid development of information technology in Vietnam, online training studies focusing on TV teaching methods have also developed strongly. Specifically, there are programs to teach university exams, learn foreign languages… on VTV2 channel of Vietnam Television. Beside universities, since 1993, the Voice of Vietnam (VOV) and Vietnam Television (VTV2) have implemented hundreds of training programs including both granting and non-granting diplomas and certificates on VOV and VTV. These programs have served millions of people across the country who are currently in need of fostering and updating their knowledge of the subjects and issues they are interested in. In 2003, the Ministry of Education and Training collaborated with VTV2 to have a research project on the establishment of a separate television channel for education. Besides training institutions and state agencies, businesses have also started researching and conducting a pilot business of online training through the production of video tapes, audio tapes, CD-ROMs. 2002 was recognized as the first year that commercial training activities were an independent form of training in the field of training via the Internet at Website: www.truongthi.com.vn. Up to now, most training institutions have built websites and provided online training services, online teaching via the Internet to train for certificates, diplomas or traditional training support. By 2009, the majority of training institutions had built websites and provided online training services through video conferencing (Video Conferencing), via the Internet for training, certification, and graduation or support traditional training. In the field of interactive teaching, there are hundreds of companies, enterprises and training institutions providing online teaching services. It can be said that teaching through information and communication networks has gradually become no longer strange in the Vietnamese education system. However, online training is a new form of

training that has been introduced and developed in training institutions recently. In particular, the management of online training activities still has many problems, there are no specific sanctions suitable to reality.

Up to now, in parallel with the traditional training model, many domestic training institutions have implemented the online training model. These new training models have grown to be very diverse and powerful in a short period of time. In order to manage this type of training, the Government and the Ministry of Education and Training have issued a number of documents such as: Regulations on organizing training, examinations, tests, and granting of diploma certificates in the form of distance learning is promulgated by the Minister of Education and Training under Decision No. 40/2003/QD-BGD&DT dated August 8th 2003; Decision No. 1559/QD-TTg dated September 10, 2015 approving the Distance Learning Development Project for the period 2015-2020. Along with the development of the Internet, the ICT infrastructure and legal basis for content management on the Internet have become more and more complete with the introduction of the following documents: Decision No. 1497/QD-TTg dated November 8th, 2018 of the Prime Minister on the approval of the National Information Development Strategy to 2025; Law on Information Technology promulgated on June 29th, 2006.

Internet is increasingly popularized to remote areas. The speed of the Internet connection is also constantly increasing, significantly contributing to the development of online training. Online training has only developed in recent years after high-speed Internet transmission technologies such as Lease Line, ADSL,... were born.

In terms of management, online training institutions can be classified into the System of formal training institutions that award degrees according to the national education system and the System of non-formal training institutions. There are many informal training institutions that have succeeded with models of foreign language training, university exam preparation, knowledge refresher training… via the Internet. Formal online training institutions that grant degrees according to the national education system include the University of Information Technology - Vietnam National University, Ho Chi Minh City. This is a public university specializing in information technology, established under the Prime Minister's Decision No. 134/2006/QD-TTg dated June 8th, 2006. Currently, the university is organizing training courses and awarding degrees according to the regulations of the Ministry of Education and Training for bachelor's systems majoring in information technology (networking, applications). In addition, the Information Technology Institute – Vietnam National University, Hanoi is also an effective E-Learning implementation and application unit through the online testing system (CmTest) using tests for all educational forms.

Regarding the application of technology in online teaching, many online teaching systems are deployed on the open source Moodle platform. The Vietnamese Moodle

community was established in March 2005 with the aim of building a Vietnamese version and supporting university to implement Moodle. Since then, many universities, organizations and individuals in Vietnam have used Moodle. It can be said that Moodle is one of the most popular learning management systems in Vietnam. The Vietnamese Moodle community helps users solve problems with installation, how to use features, as well as how to edit and develop. The Vietnamese Moodle community is built by the same Moodle software. According to statistics published on the Vietnam Moodle Community Website, there are currently 799 Vietnamese organizations and individuals using Moodle open source software. A typical specialized agency of the Ministry of Education and Training is the Department of Information Technology, which has also been researching information technology solutions for Vietnam using the Moodle open source learning management system.

Today, parallel to the traditional form of training, online training has been asserting its position in the education system because of its outstanding advantages such as saving time and training costs, learners do not have to attend class but can still participate. Currently, many universities have begun to move towards and gradually shift to online training (Do et al., 2021). Although there are still quite a few limitations, mainly because there is still no support policy and development orientation from the governing agencies, but online training is still gradually confirming the future of market expansion in Vietnam. It can be said that any industry or unit can use online training as a tool for any internal or external training activities, especially training service providers. The government is also making long-term plans to support the promotion and implementation of online training for propaganda and education activities for the people.

The Industrial Revolution 4.0 will change the way of life, work and communication of all mankind in a completely new way (Do, 2020). Industry 4.0 is said to be based on the development of many technologies, especially the internet, cloud computing, information technology, artificial intelligence, 3D technology, and automation. In the world, the first, second and third industrial revolutions have helped the economies of many countries develop brilliantly. It can be clearly seen that the efficiency in the application of high technology brings a leap in productivity and production quality, many countries have widely deployed the integration and close connection of many different technologies to ensure Optimum production efficiency including online training. The industrial revolution 4.0 has been playing a very important role and is significantly contributing to promoting the development of online mining despite the fact that in Vietnam there are still many difficulties such as:

The training facilities of universities in Vietnam are still very poor. Students and trainees do not have the habit of self-study and group work, do not have independence, still depend a lot on lecturers, are not self-conscious in learning... Ability to apply information technology in teaching of the majority of teachers is still limited, although there are projects and tools to support teachers in preparing lessons. To organize an online class requires

teachers to spend more time and effort than traditional teaching, the traditional way of learning will still have to be the main and popular method because it is suitable for all learners and attached to the habits of each person from an early age. Therefore, with the traditional way of learning, learners feel safer when listening to live lectures, solving problems directly with lecturers. Traditional learning method aslo suitable for many different types of students, for those students who are not self-disciplined, do not have the habit of working on their own or actively working, the traditional way of learning more or less has an impact on them when they are taught directly with the teacher in class. For teachers, it is also possible to observe the learning attitude and learning ability of each student through direct contact. As for the online training model, it is not suitable for everyone, it is only suitable for those who have certain computer knowledge, have real needs and self-study. For each process, not all content easily converts to online training. There is a process where the content is practical and highly practical, it is difficult to use online training to teach, but for skill-based subjects and the process changes quickly, requiring timely updates, then it will be the appropriate content of online training.

4. Discussion and Conclusion

The above research results show that the research and application of this type of online training is receiving great attention and development in Vietnam with the influence of the industrial revolution 4.0 to solve difficulties relate to online training. In order for universities to improve the quality of online teaching to approach the industrial revolution 4.0, the study proposes a number of solutions as follows: The Government needs to build a model to evaluate the quality of online teaching in universities to approach the industrial revolution 4.0 and evaluate the current status of online teaching quality in universities; Raising awareness for administrators and lecturers about online teaching; Completing the online teaching management document system; Strengthening the system of equipment and software to support online teaching; and Regularly check and evaluate the organization of online teaching at universities.

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