ASSESSMENT OF IMPACTS OF E4.0 ON HIGHER EDUCATION AND BREAKTHROUGH SOLUTIONS TO IMPROVE THE QUALITY OF HIGHER EDUCATION IN VIETNAM TODAY

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ABSTRACT

The article presents the nature, role, and limitations of Vietnam's higher education in accessing I4.0. At the same time, based on analyzing general perceptions of quality, the article gives arguments for breakthrough solutions, especially deeply analyze practical factors that suggest further breakthroughs, thereby drawing breakthrough lessons to improve the quality of higher education in Vietnam today.

Keywords: *Industry 4.0, University, quality solution*

Introduction

Due to having not yet completed industrialization and modernization of the country, Vietnam is even more necessary to organize research on E4.0 to give out the response of Vietnamese society in general and higher education in Vietnam with the hope of finding the shortest way to catch up with developed countries. Up to now, after a period of so rapid development in quantity, it can be said that quality is the most important issue of higher education in Vietnam, as well as the expectation of a nation, a generation of Vietnamese people for national higher education. In this scientific article, we mention two major issues for higher education in Vietnam: (1) Impact of E4.0 on higher education; (2) Breakthrough solutions to improve the quality of higher education in Vietnam today

1. Impacts of E4.0 on Higher Education

1.1. About nature

E4.0 is being built based on the third revolution, the digital revolution that occurred from the middle of the last century. It was characterized by the consolidation of technologies that blurred the border lines among physical, digital, and biological objects. There are three reasons why today's transformations represent not just an E3.0 extension but also the emergence of an E4.0 that has following distinctions: velocity, range, and system effects. The current breakthrough rate has no historical precedent. When compared to previous industrial revolutions, E4.0 is growing exponentially rather than linearly. Moreover, it is virtually disrupting the structure of every industry in every country. And the breadth and depth of these changes heralds the transformation of entire production, management, and governance systems. Billions of people have the possibility of connecting to mobile devices, with unprecedented processing power, boundless capacity of storage and access to knowledge. And these capacities will be multiplied by emerging technological breakthroughs in areas such as artificial intelligence (AI), robotics, IoT, self-driving cars, 3-D printing, nanotechnology, engineering biotechnology, materials science, energy storage and quantum computing.

1.2. Role of higher education in E4.0

E4.0 urges us to think creatively about production process, value chain, distribution, and customer service. Meanwhile, the future of education highlights the tremendous need to look beyond these areas and use IoT strategy to prepare the incoming workforce for the challenges ahead. Universities emphasize their role in shaping future technology by becoming testbeds for innovation and education of future generations. Traditional education has contributed greatly to the current industrial development and technological advancement. However, for higher education to provide future generations with a suitable combination of skills and knowledge; a must-have question about how universities will be affected by E4.0 and how education delivery method will be transformed.

Different opportunities available will shape the role that can be implemented by higher education in E4.0. Combining the power of traditional higher education with the growing trend of MOOCs represents the necessary steps to expand high-quality education.

1.3. Limitations of higher education in Vietnam in accessing I4.0

Firstly, Vietnam does not have clear orientations that lead students towards STEM (Science, technology, engineering, and mathematics), resulting in the situation that the best students often choose industries of economy, foreign trade, finance, banking..., thereby there is a shortage of human resources in some fast-growing technology industries in the era of digitalization and automation, especially IT industry. The latest report on IT industry of Vietnam works shows that for the last 3 years, the number of jobs in this industry has increased by 47% per year on average, but the number of human resources has only increased by 8%.

Secondly, the connection between universities and enterprises has been still loose, affecting the quality of training as well as supporting trainees in gaining practical knowledge, thereby it can be easier for them to apply for jobs after graduation. As a result, even in fast-growing industries, graduates lack many of the skills that enterprises need.

Thirdly, it has not focused on training high-level cognitive skills such as problem solving, logical reasoning, teamwork, quick adaptation skills; has not yet created the motivation and capacity for lifelong learning and continuous learning for students, especially skills in exploiting open learning resources, massive open online courses (MOOC) that is mainly due to the limited English proficiency of students. These not only reveals the major shortcomings of the education system in Vietnam for 30 years of opening and integration but also shows more about the system's unreadiness for E4.0 in terms of both two perspectives - "ability to stand on the shoulders of giants" thanks to Internet and English-based technologies, as well as ability to meet the requirements of lifelong learning and continuous learning.

Fourthly, contents of educational programs at all levels in general and at the higher education level have many inadequacies and limitations, failing to keep pace with development needs in the current context. *The content of training knowledge has still been mainly theory, less practice, failed to make a connection* between domestic and international higher education standards*, the curricula have still been heavy with a large duration,* methods and forms of teaching organization have still been quite backward, credit-based training in Vietnam has not been true to the spirit of credit. The way of teaching and learning has not yet gone beyond the spirit of the fixed curriculum system. The initiative of students has still been weak. The innovation of teaching methods at universities in our country today has sometimes still been only formalistic, when teaching devices such as projectors, videos... are just supporting facilities to improve the teaching quality.

The above shortcomings and weaknesses make higher education in Vietnam lag behind, and this lag is having a negative impact on the socio-economic development of the country. *The quality of trained human resources has not met the practical requirements, limited in ability to research, and publish research results. These weaknesses reduce the competitiveness of the economy in terms of international integration.*

2. Breakthrough solutions to improve the quality of higher education in Vietnam today
2.1. Concept of quality
What is quality? There are many definitions of quality from different perspectives, specifically quality is excellence; quality is also defined as customer satisfaction; quality is also a threshold; quality is value added, which means value added to learners in the process of education and training; quality is worth the money spent

from learners and from investors whether public or private. The concept of quality here focuses on efficiency. It measures the output compared to the input. The most accepted concept is fitness for purpose when the purpose is fitting. Therefore, it must be concluded that quality is a very complex concept. The universities must distinguish and meet the quality requirements (objectives) set by students, by the academic world, by the labor market (employer)/society, and by the Party and State's expectations.

On the other hand, we need a holistic view of quality, but quality can only be defined when specific factors are considered. Organizations that rank universities in the world must rely on specific criteria of each field of operation of the universities such as training, research, community service and internationalization. Each ranking has its own priority points based on a particular philosophy of higher education quality. No university is number 1 on all ranking criteria of all quality rankings in the world.

2.2. Necessity for standards and criteria to be able to evaluate quality.

Universities can set its own standards/objectives, but in doing so, they must consider the criteria and standards set in the outer world. Therefore, in Vietnam, a set of standards in 2014 have been established with 10 standards and 61 criteria, followed by a set of standards with 25 standards and 111 criteria based on the foundation of the set of standards for assessing quality of universities by AUN-QA. Basically, the old set of standards by which 117/122/237 universities have been recognized as qualified before June 2018 is the set of standards for evaluating results. Two new sets of standards, one is for assessing quality of training programs and the other is for assessing the quality of educational institutions that we are deploying. They are two sets of standards for evaluating the school's management work in the principle of PDCA. That is, with any field, whether it is strategy, system, function or result, the Universities must PLAN, DO, CHECK and ACT. The philosophy of this set of standards is as follows:

- Continuously improve to step up each ladder of progress. If we do not innovate and improve, we will lag not only internationally but also domestically.

- It is needed to compare to set benchmarks for the benchmarks we need to move on. They are domestic and international best practices that need to be referenced to benchmark themselves, to be able to move fast or slowly. The experience in testing of many Vietnamese universities has shown that this is the most difficult step along with checking and evaluating before improving because we are not familiar to do this.

- It is needed to have resources to move forward, human resources, material facilities and external relations for insourcing and outsourcing. AUN-QA Standards themselves are also clearly defined in Criterion 12.1: Plan to continuously improve the School Quality including *policies, systems, processes, procedures, and resources* to achieve the best practices in education, research, and service. Resources here include human resources, staff of lecturers-employees, material facilities, libraries, finance, and external relations.

SA and testing are both open and public, in terms of questions, answers and scales (like rubrics). Therefore, it is possible to explain why all schools passed the testing because after SA, they found themselves that they did not achieve the benchmark, no school dared not to register for the testing. Up to now, only 140/237 pedagogical universities and colleges in our country have passed the testing.

2.3. Arguments for breakthrough solutions

As defined, breakthrough has three important characteristics: sudden and strong break and consumption of few resources. A solution must not be called breakthrough if any of these three elements is missing. Breakthrough solution can also be understood as having to be successful (break through the obstacle) in a short time (sudden) and require the least resources compared to other solutions.

In education, there are solutions that have been considered as breakthrough such as reform of curricula and textbooks. In fact, reform of curricula and textbooks is not a work that can be done soon, can never be done in a few years, even not less costly. The cycle of change of general education curricula & textbooks must be 12+x years. "x" is to develop curricula and compile textbooks for the first grade and several years to evaluate the effectiveness of new curricula & textbooks. So, when the reform has not been completed, there is a need to reform what we have just reformed. However, there are things we recognize their breakthrough nature only when they are deployed. For higher education, up to now, it can be said that two solutions that we have implemented can be considered as breakthrough solutions: quality assurance and inspection at universities and giving autonomy to universities.

Firstly, for the first-time SA and education quality accreditation, we totally review the university governance and management at a system-wide scale. The inspection encourages each school and the whole system to look back on themselves comprehensively based on a specific quality assurance model (currently of AUN-QA). Before that, there were quite many things that universities could not do and did not know how to adjust other than doing based on management experience. SA and QA require the efforts and efforts of the whole school, from the Chairman of the School Board to female cleaners. In the process of overall quality management, nobody can stand aside. It is also SA and QA that help the schools make quite basic and methodical changes in administration, management, and leadership. This is clearly seen in most of the schools that have participated in the inspection, especially those in the fair average group or below account for the majority of Vietnamese universities. Therefore, it can be said objectively that the introduction and implementation of self-assessment and quality accreditation of universities and colleges are **a step forward/breakthrough** of higher education.

Secondly, give autonomy to universities. It is the least expensive solution. Although there have been no concrete results, it must be considered as an inevitable step, the trend of higher education in the world [1]. In the current

context, giving autonomy to the schools also means promoting the innovation process, bringing into play the initiative for the schools to expand the market and restructure to survive and develop, thereby leading to the restructuring of the whole system. So, although university autonomy is not predetermined, it has practically promoted the process of restructuring the higher education system before there are macro-level directives. It's also noted that restructuring the system is also one of the breakthrough solutions that the topic "Strategic orientation, breakthrough solutions to fundamentally and comprehensively innovate education and training" proposed and managed by Assoc.Prof.Dr. Pham Van Linh in 2013-2015.

It is also a predetermined coincidence that we have implemented university autonomy and university quality accreditation mostly in parralel. Autonomy must come with accountability like two sides of a coin. On the other hand, scientists have proved that quality accreditation is also a tool for universities to explain to society and a tool for the State and society to monitor the exercise of their autonomy [2].

From the practical implementation of the above two breakthrough solutions, the following 3 comments can be drawn:

- For the policy of giving autonomy to universities to become successful, future reforms should be more radical, focus on *academic autonomy* and reducing the words "under the regulations". Universities should be given more freedom in setting their own admission standards, opening new majors at different levels after high school to respond to fluctuations in the labor and employment market according to the current general restructuring trend of world higher education [3]. It is also very important to find a balance between autonomy and accountability through promoting inspection of educational institutions and evaluating internal quality assurance processes in lieu of issuing legal regulations.

- SA and QA comes from the philosophy of the set of standards for evaluating the quality of universities and training programs that is methodical and sequential, so it is only a necessary condition for quality assurance, not a sufficient condition for acceleration. Is it enough to follow the quality assurance process? It's needed but not enough. The key issue is that the height of the ladder is constantly growing; is the content of innovations and improvements from management structure to policies, to plans and implementation in most fields of the schools such as training programs, teaching methods and assessment of learning and research result, scientific research, and services. The set of standards only requires improvement while the way to improve is the school's business. Choose a partner to compare, take that as a standard, plan to reach the standard, and after meeting the standard, find a new standard to continue developing. The higher the ladder is, the greater the effort is made. But the faster the progress is.

- Autonomy is not a magic wand and a universal key to the development of higher education. Resources for higher education are very important. As analyzed in [1] the number of global top 500 universities of a country is linearly dependent on *national resources* as expressed in gross domestic product. The schools that pilot the autonomy if having no effective solutions to mobilize resources from scientific and technological research activities and transfer, service and other resources mobilized from society (such as donation funds) etc. but only relying on tuition revenue cannot make a breakthrough in quality.

Therefore, one/several more breakthrough solutions are needed to be able to resonate with the two solutions being implemented to create a group of solutions to accelerate the quality of higher education in Vietnam.

2.4. Practical factors suggesting next breakthroughs

Looking back on the results of QA for the past time (117 universities and colleges in the first phase according to the Set of Standards 2014 and 23 schools in the second phase according to the new Set of Standards – until now) as well as following the international rankings of the Universities, it can be seen that besides schools that maintain quality with traditional normal pace such as Vietnam National universities, Universities of Science and Technology, etc., there are schools that show outstanding breakthrough developments in each field such as: international publication, jobs for students and resource mobilization. These are reflected not only in the QA results but also in the international rankings.

The QS University Ranking (the most prestigious global ranking according to Wikipedia 2020 and the most widely considered university ranking worldwide according to Alexa Internet) shows that in Vietnam, in 2019 and 2020, Vietnam National University - Ho Chi Minh City ranked in the world group of 701-750 and Vietnam National University - Hanoi ranked in the world group of 801-1000; There were 8 universities in the Asia 500 group including VNU - Ho Chi Minh City ranked 143, VNU – Hanoi ranked 147, Ton Duc Thang University ranked 207, Hanoi University of Science and Technology ranked 261-270, Can Tho University and University of Danang ranked 401-450, respectively, Duy Tan University and Hue University ranked 451-500, respectively [4]. It is easy to see that in the public sector, Ton Duc Thang University and in the private sector Duy Tan University showed a breakthrough when Ton Duc Thang University ranked above Hanoi University of Science and Technology and Duy Tan University ranked on par with Hue University. What are the causes?

A detailed study of the QS Scorecard showed that Ton Duc Thang University made a breakthrough in *outsourcing* – outperforming the mobiliztion of resources from outside compared to two VNUs in 4 criteria: i) international research network (79.4 vs. 62.3 and 51.1), ii) domestic exchange (84.5 vs. 44.1 and 35.3), iii) international exchange (49.7 vs. 28.3 and 3.4), iv) international lecturer (78.4 vs. 34.3 and 11.7). Thereby, Ton Duc Thang University also excels in 2 publication criteria: i) International article/lecturer (7.3 vs. 5 and 2.6) and ii) citation/article (65.5 vs. 55.2 and 51.9) [5]. However, the prestige among employers (18.4 vs. 34.4 and 42.1) and in academia (9.8 vs. 33.7 and 42.9) of Ton Duc Thang University is still significantly lower than that of two

national universities. Duy Tan University was also included in the ranking because the criterion of international lecturer was quite good (17.6) compared to 11.7 of VNU-HCM.

On the other hand, if analyzing according to QS Start criteria of two Vietnamese schools participating in the assessment (FPT got 3* and Nguyen Tat Thanh got 4* - maximum 5*+) [6], the breakthrough orientation of these two schools were material facilities (5*) and employment for graduates (5*). In addition, Nguyen Tat Thanh School also oriented to have equal access to opportunities and resources for disadvantaged people (inclusiveness 5*) and academic development (5*) better than FPT (3* and 1*, respectively. Although the overall score of Nguyen Tat Thanh School was 4 * according to QS Star, it was not included in the ranking of top 500 Asian schools according to QS scale [1].

In addition to the universities that have made breakthroughs in each stage of quality improvement mentioned above, it was also necessary to mention Phenikaa University (Old Western Citadel) with breakthroughs in material facilities investment and policies to attract talent scientists and development of internal resources in research. The Nature Index [7] ranked Phenikaa University in a fairly high position in top 10 universities in Vietnam. According to the figures published in 2020 (June 1, 2020), in 2019, Vietnamese scholars published 84 works (on 80 selected journals) with total contribution of 16.19, of which Vietnam Academy of Science and Technology ranked the first (31 publications with a contribution of 3.23) followed by Phenikaa University (5 publications with a contribution of 2.98), ranked above Duy Tan University (14 publications with a contribution of 2.96), ranked above two National Universities (3/1.06 and 15/0.96) [2].

2.5. Breakthrough lessons

From the above practical analyses, we can draw the following two lessons:

Firstly, make a breakthrough in resources. It is advisable to apply outsourcing if internal sources are not enough. Resources are not only the investment of money but also the quality of the team, those who are able to bring money to the schools in different ways from attracting learners to transferring technology. All schools that were cited and included in the above international rankings have had good investments in material facilities, satisfactory policies on staff or well mobilized external resources. Phenikaa University, for a short time, thanks to the policy of attracting good talents (for about 2 years after the shareholder restructuring), has had a breakthrough in scientific research and international publication. The advantage of this breakthrough solution is also to exploit the NAFORSTED Fund of the Ministry of Science and Technology and topics at all levels [8]. The lesson of mobilizing external resources through expanding domestic and international cooperation is from Ton Duc Thang University and Duy Tan University.

Secondly, make a breakthrough in employment of graduates (5* lesson from FPT and Nguyen Tat Thanh). Many teachers at the schools that we conducted the accreditation said that if they have good output, students would be passionate about learning. So, applying the training to enterprises like FPT was a direction. What other direction is there? Not all 237 universities can find major and specialized enterprises like FPT or build partnerships with more than 100 enterprises like Nguyen Tat Thanh. Therefore, instead of trying to provide students with a stable job when they graduate, we have another way to give them the ability to survive, establish a business and develop in the jungle of the labor market.

If the Schools cannot approach in the direction of excellence, teaching learners what is the most sublime and most difficult, requiring a lot of resources (hundreds, thousands of billions of dong/years), we can approach modern education by *exploiting for the hidden talent in each person* for their self-development. This is the educational philosophy of the personalized education of the 21st century to meet Industry 4.0, also known as tailor-made education [9]. Everyone has a hidden talent like a precious mine deep underground or like a rare element that must be carefully distilled to get it out. It is the responsibility of the schools to help those talents reveal themselves and help learners excel from those talents. When they feel that they are superior (even in a very narrow niche of their ability), they will be passionate and it is from that passion that they will study well and, as a result, will get a good job, will start a business and will be successful when they graduate. The success of learners is evidence for the school's quality. This proof is even higher than the school's promotion in the rankings.

3. REFERENCES

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4. QS University Ranking https://www.topuniversities.com/university-rankings/asian- university-rankings/2020

5. With this strength, in the ranking of global universities of Shanghai University of Transport, Ton Duc Thang University is the only Vietnamese university in top 1000.

6. QS Star https://www.topuniversities.com/universities/nguyen-tat-thanh-university-nttu-hcmc

7. Nature Index https://www.natureindex.com/country-outputs/Vietnam

8. According to Self-Assessment Report of Phenikaa University 2019 from 2015 to now, 26 projects at the State level (Nafosted), 03 projects at ministerial level and equivalent, 04 topics at grassroots level were implemented;

278 international articles on the list of ISI, SCOPUS (77 articles published with QT partners) and 40 domestic articles were published; 4 patents and 19 intellectual property applications were accepted.
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[1] The results of the 2017 Quality Assessment show that Nguyen Tat Thanh School only achieved 80.33% of the criteria. That is just enough to recognize the standard.
[2] However, there is no Ton Duc Thang University in this top 10 of Vietnam.