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Developing Science and Technology Human Resources to Meet Digital Transformation in Vietnam

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ABSTRACT: The article analyzes and clarifies the reality of the development of science and technology human resources in Vietnam in the trend of digitizing the economy that is happening not only in Vietnam but also in most countries. In the world. For digital transformation, the most important factor that determines success or failure is science and technology human resources - the main workforce to operate the digital economy. However, in fact, the human resources of science and technology in Vietnam are still limited, lacking leading experts and well-invested, professional and large-scale scientific and technological organizations. On the basis of analyzing the current situation, limitations and causes, the author proposes a number of solutions to develop human resources in science and technology, to meet the needs of digital transformation and to suit the situation of Vietnam.

Keywords: Human resources, digital transformation, digital economy, digital human resources, Vietnam

Introduction

Research trends in the fields of digitalization have been mentioned quite popularly in recent times. Perhaps the most mentioned is the term digital economy. In the digital economy or other digital issues and fields, human resources are an important factor determining the fundamental success of an organization.

Data61 organization under CSIRO, the data and digitization agency of the Australian national science organization, in collaboration with the Ministry of Science and Technology of Vietnam, has developed the report The future of Vietnam's digital economy: direction to 2045, explore trends affecting Vietnam's digital economy to 2045 and propose four development scenarios for Vietnam. The work "Vietnam's Future Digital Economy, towards 2030 and 2045" by Cameron A, Pham TH, Atherton J, Nguyen DH, Nguyen TP, Tran ST, Nguyen TN & Trinh H Y. Hajkowicz S has shown the trend of images. influence the development of the digital economy in Vietnam until 2045. New wave of digital technologies - artificial intelligence, blockchain, Internet of Things and cloud-based services and computing - has the potential to transform Vietnam into Asia's high-growth economy and improve the quality of life of Vietnamese people in the coming decades.

The report of the International Labor Organization-ILO (2016) has mentioned the developments of technology that are changing jobs and businesses. The report highlights the challenge facing policymakers, businesses, workers and their representatives in navigating the technological changes taking place in Asia's labor markets in a sustainable way economically and socially sustainable. In particular, the challenging issues of digital human resources and human resource management approach in the context of digital transformation in Asia were mentioned.

In the article on digital human resources, Nguyen Hai Hoang (2020) has mentioned in detail the issues of digital human resources to meet the requirements of the digital economy in Vietnam. The digital economy was born to replace the traditional economy. Therefore, there needs to be a change in the labor structure in which digital human resources must be focused on development. The article clarifies the concept, content and characteristics of digital human resources; propose some solutions to develop digital human resources in Vietnam.

In the context that digital transformation is an inevitable trend and human resource requirements for digital transformation, this article analyzes the inevitability and mentions some direct solutions

for scientific human resources. technology in Vietnam in the current digital transformation context.

Research Methods

To have a tool to review and research the topic, the authors use related terms as follows: Digital economy is an economy based on digital technologies, in which conomic activities use digital information and digital knowledge as the main factor of production. Using the internet and information networks as an operating space, taking telecommunications and information technology (ICT) services as the core and main driving force to increase labor productivity and optimize the economy (Hoang, 2021). Human resource is the sum total of quantity and quality of human being with a combination of intellectual and physical criteria and moral-spiritual qualities creating human capacity to mobilize in the process creative labor for the development of society (Hoang, 2021). Science and technology human resources are human resources associated with high-level capabilities and working in the field of science and technology. These human resources are often well-trained, superior and have superior qualifications compared to human resources in other fields (Hoang, 2021).

Digital human resources - There are many different conceptions of digital human resources, but the authors believe that digital human resources is a special form of science and technology human resources. This human resource can be understood in a broad sense, including both human resources and human resources that are non-human forms but have many working characteristics similar to humans. These human resources exist in the form of: artificial intelligence - AI, robots, automation technology systems, etc. This could be the research team's new approach to the problem of referring to suitable human resources. in today's context of digital transformation and Industry 4.0.

Results and Discussion

More than 1000 years ago, Vietnam carried out the process of moving the capital from Hoa Lu to Dai La (later renamed Thang Long), this is a great and historic transformation led by the head of the country. country at that time - King Ly Thai To. This is not only a transformation in terms of geography, from a narrow and dangerous area to an empty plain, but also a shift in awareness and thinking about managing the country, from relying on difficult terrain to developing a country defending against invaders to a land favorable for development, considering development the key to the survival of the nation. Following the general trend of the whole world, our country is now also entering another transformation, which is decisive for the country's outstanding development, which is digital transformation. On September 27, 2019, the Politburo issued Decision No. 52-NQ/TW to actively participate in the Fourth Industrial Revolution. Along with that, the Prime Minister also issued Decision No. 749/QD-TTg dated June 3, 2020 approving the National Digital Transformation Program to 2025 with a vision to 2030. These are clear examples. for the determination to digitalize the Vietnamese economy from the highest level of the country's leadership.

Digital transformation is a common trend of most countries in recent years when witnessing the strong development phase of the Fourth Industrial Revolution. Technological achievements from this Industrial Revolution include the Internet of Things, big data, artificial intelligence), cloud computing and blockchain technology. These technological breakthroughs have had a comprehensive impact on the contemporary world, redrawing the world economic map with the decline in power of countries based mainly on resource exploitation and the increase in the power of countries rely heavily on technology and innovation. The economic model in the world is also changing at a rapid pace, from an economic model based on natural resources or a part of natural resources to an economy based mainly on science and digital economy. The Fourth Industrial Revolution also had a strong impact on Vietnam, creating new opportunities for our country to integrate more deeply and effectively into the world economy, applying breakthrough achievements of public science and technology. technology to close the development gap with other countries. According to a forecast of the Commonwealth Scientific and Industrial Research Service of Australia (Vietnam’s Ministry of Science and Technology and CSIRO’s Data61,

2019), Vietnam's GDP could increase by about US$ 162 billion in 20 years if the digital economy transformation is successful. Meanwhile, a research report by Google, Temesak and Bain Company (2020) announced that Vietnam's digital economy will reach a size of about 3 billion USD in 2015, increase to 9 billion USD in 2018 and forecast to reach 30 billion USD by 2025. Therefore, in order for Vietnam to break through with the powers of the five continents, the application of the digital economy in our country needs to follow the general trend of the whole world.

For successful digital transformation, it is necessary to have high-quality human resources, specifically, an abundant and quality human resource of science and technology to serve the process of transforming, shaping and developing the digital economy in Vietnam. Vietnam. This is also the main workforce that determines the success or failure of this transformation. Therefore, the transformation of the economic model in our country to the digital economy is the process of shifting labor structure and developing scientific and technological labor resources. Accordingly, human resources of science and technology will take the leading role in the total labor force of the whole society. Reality has proven, the number of jobs that artificial intelligence, automation systems and robots can perform is increasing rapidly, which means that the jobs traditionally performed by humans will be lost. significantly reduced in the future. The repetitive and simple manual jobs in the manufacturing, processing, agriculture, textile industries, etc. will be replaced the most, while the highly specialized jobs and occupations will be replaced. Social work will hardly be replaced by automation. According to a study by the Organization for Economic Co-operation and Development (OECD) published in 2016, it is estimated that about 9% of jobs are displaced by robots and automation (the projections are made on the basis of the assessment) of 21 major countries including: UK, Germany, Italy, USA, Japan, Korea, Spain, Belgium, Norway...)

According to a report by the International Labor Organization (ILO) in 2016, Vietnam has 70% of workers in manufacturing occupations that are at high risk of losing their jobs under the impact of the Fourth Industrial Revolution. Meanwhile, human resources who can master technology, operate machinery and production lines must be high-quality human resources, science and technology human resources are still very limited. Engineers and programmers are still "hunted" by businesses with great income and remuneration, showing the attractiveness of this industry and the shortage of human resources in science and technology not only in research but also in business operations. Many famous Vietnamese scientists working abroad are also invited by large domestic economic groups to work with income and remuneration not inferior to private organizations in the world. The development of human resources in science and technology is an inevitable trend not only in Vietnam but also in most countries around the world for the purpose of successfully applying and operating the digital economic model. economy based on science and technology.

Difficulties and challenges

Firstly, the legal system and institutional environment for the development of the digital economy in our country are still inadequate, not really synchronous and tight. Although there have been policies to encourage, support and promote the digital economy from the Party and State, we have not really been able to adapt to the rapid transformation and development of the Industrial Revolution 4.0. Many new business models were born, such as the sharing economy model, leading to the lack of legal regulation, many conflicts between traditional and new business models. State management agencies are also quite confused when resolving conflicts and managing activities in the digital economy, specifically: handling disputes between enterprises applying the sharing economy model and traditional business enterprises in the fields of transportation, housing, hotels...; the management and collection of taxes with forms of online business, business via social networking platforms, global business... If the management agency bans, or tightens the legal environment, it cannot handle the Disputes and conflicts will lead to international businesses moving to countries with more favorable business environment and conditions. On the contrary, if it

is not possible to manage new business forms, it will easily create unequal competition with domestic enterprises, traditional business models and will cause huge tax losses for businesses State budget.

Secondly, human resources in science and technology are not enough to ensure both quality and quantity to operate the digital economy. Previously, we oriented to focus on low-cost labor to create jobs for a large part of the labor force in rural areas, with low qualifications. This leads to a serious shortage of high-quality human resources, especially science and technology human resources, human resources for breakthrough technology fields such as mastering artificial intelligence, blockchain. The forms of education and training of developing countries in general and Vietnam in particular have not kept pace with the rapid development trend of the digital economy and the creative economy in the Second Industrial Revolution 4.0. In addition, according to research by Oxford University and McKinsey Group (2017), in the next 15 years, about 50% of jobs in developed countries will be replaced by automated processes; this rate is higher in developing countries like Vietnam because the value added of the labor force is low compared to the world average. Therefore, the need to train and retrain human resources to meet the requirements of the digital economy becomes urgent.

Thirdly, the telecommunications infrastructure is not really sufficient for storing and using data for the development of the digital economy. From data, digitized models are the foundation for creating soft infrastructure to effectively utilize idle social resources and optimize economic activities. However, the database in Vietnam is still scattered, not yet centralized connection. Agencies and departments all build their own databases, which are not connected and interconnected, which easily leads to confusion and deviation in usage and analysis. Therefore, it is necessary to have a national data storage system as an important solution to remove this bottleneck, create a stable and unified input data source, help businesses and organizations Technology in Vietnam competes fairly with international technology services.

Limitations and causes

Currently, according to statistics, Vietnam has 1,001 central science and technology organizations, accounting for 66.1%, and 512 local science and technology organizations, accounting for 33.9%. By field of activity: Humanities and Social Sciences has 149 organizations, accounting for 9.8%; Natural Science has 124 organizations, accounting for 8.3%; Agricultural Science has 327 organizations, accounting for 21.6%; Medical-Pharmaceutical Science has 103 organizations, accounting for 6.8%; Science, Engineering and Technology has 810 organizations, accounting for nearly 53.5% (Ministry of Science and Technology, 2011). Although the number of science and technology organizations is many, the number of strong science and technology collectives is very few, the science and technology organizations, especially in the state sector reaching the international level, are almost nonexistent professional, methodical and limited in many aspects.. The head of the organization has not boldly screened personnel or has the right but in fact cannot exercise that right. The mechanism of authority to assign responsibility to the heads and individuals who directly work in science and technology organizations still has many shortcomings, lacks specificity, and has not linked results and operational efficiency to the organization.

This situation leads to the current common phenomenon in science and technology organizations that there is a surplus but still a shortage of staff doing scientific research. Some scientific staff are not properly used professionally, so they do not maximize their capacity. The main reason for the lack of professionalism as well as the inability to develop strongly is that the funding for science and technology development in Vietnam is still quite modest. Currently, the State invests about 0.6 GDP, equivalent to about 2% of state budget expenditure for science and technology development (Liem, 2020). Of which, nearly 90% is for development investment and recurrent expenditure, only a meager amount is left for scientific research and technology development. This investment is too little compared to other countries in the region and the world. This shows that Vietnam is lagging behind in terms of

technological readiness, innovation and labor productivity compared with some countries such as Israel and Korea at 4.5%; Japan is 3.2%; China is 2.1%... This issue was stated by the Prime Minister himself at the Vietnam Innovation International Exhibition in 2021: "Because we don't really have good policies, the basic well-prepared, or good, well-proportioned problems to stimulate the creativity and dedication of a large number of scientists and experts. The legal framework and mechanisms and policies are not synchronous, not really creating motivation for the development and application of science and technology.

Regarding human resources of the Faculty of Technology, science and technology staff are currently concentrated mainly in central scientific organizations such as the Vietnam Academy of Science and Technology, the Vietnam Academy of Social Sciences; in major economic centers such as Hanoi and Ho Chi Minh City. Ho Chi Minh and Da Nang; In the block of education and training institutions such as universities, colleges... In areas far from the center, the percentage of science and technology staff working is still very low, even in some places there is none. Human resources in science and technology are divided geographically, leading to the situation that special places that need the application of science and technology to promote socio-economic development such as the Northwest and the Central Highlands cannot attract the the scientist. Although science and technology human resources are concentrated in large economic centers and central organizations, the remuneration regime for this workforce is not commensurate with their capacity and work efficiency, especially scientists in the field of research. Therefore, this group of workers often do not focus on professional work because they do other jobs outside to ensure their lives. This not only affects the quality of the workforce working in this field, but also leads to the inability to attract young, qualified human resources who are the next generation. On the other hand, the capacity of science and technology managers is not high; there is a shortage of leading experts in the industry who are capable of working directly with foreign partners. In recent years, the number of international published works of Vietnamese scientists is much lower than that of other countries in the region.

Specifically, according to data from the American Institute of Scientific Information, the number of international research works in Singapore is 69,107, Malaysia is 54,368, Thailand is 39,226 and Vietnam is 11,953. Many experts believe that we have not used and fully promoted the intelligence of Vietnamese intellectuals and scientists abroad, talented people who have not returned home voluntarily after studying abroad. who often choose to stay in the host country or a developed country to live or work. The current structure of human resource allocation in science and technology is also not really reasonable when the labor force in this field is working in the state apparatus accounting for a high proportion, accounting for 83%; while in the private sector it is very small, accounting for 17% (Institute of Scientific Information, 2019).

In the context that the country is drastically implementing digital transformation, developing science and technology human resources is an important job that determines the success or failure of the digital economy in Vietnam. Problems in allocating and using the State budget for science and technology development; Remuneration regimes, management forms, human resource allocation... still exist because we have not built a complete policy system, lack of short-term, medium-term and long-term strategies suitable to the situation. socio-economic conditions of the country to develop the field of science and technology in general and human resources of science and technology in particular.

Solutions for developing science and technology human resources to meet the needs of digital transformation in Vietnam

Group of solutions to promote the digital economy in Vietnam

Vietnam has made great efforts in approaching the achievements of the Fourth Industrial Revolution and has initially achieved positive practical changes. However, in order to take advantage of the opportunities of the digital economy, one of the most important tasks for all sectors from the Government, businesses to individuals is to carry out digital transformation.

Currently, digital transformation and digital economy are the key topics and leading development drivers that the Government of Vietnam sets out in the coming years, including 03 main items:

- Digital infrastructure and services include hard infrastructure and telecommunications network as the foundation to create soft infrastructure, which is a digital service that optimizes economic activities.
- Digital resources including open knowledge and data ecosystems that are useful for timely prediction and decision making with high economic efficiency (such as national databases on agriculture, finance, residential, land management...; online public services....).
- Digital transformation policy, including services, transformation policy from e-Government to digital government, policy on training high-quality digital human resources, digital business investment policy, safety policy information, digital sovereignty and intellectual property.

The Government needs to promote the development of e-Government in association with the role of the head, promote the application of information technology in administrative reform in order to improve the quality and performance of state agencies. better serve people and businesses. Showing determination to build an e-Government, the Prime Minister directed the establishment of the National Committee on e-Government on the basis of consolidating the National Committee on Information Technology Application chaired by the Prime Minister. government is the Chairman of the Committee. The Committee has members who are ministers of ministries directly related to the tasks in e-Government building to connect across ministries, branches and localities in performing tasks. At the same time, the Committee has the participation of representatives of the private sector to help promote the effectiveness of public-private cooperation in the implementation of this task. E-Government implementation tasks will be assessed in association with the individual responsibilities of the heads of each ministry, branch, and locality and measured through a set of criteria for evaluating the effectiveness and quality of construction results. Develop e-Government to ensure accuracy and fairness through the Committee's Working Group. According to the United Nations report on the E-Government Index in 2018, with a score of 0.59, Vietnam rose 11 places to rank 88th out of 193 countries participating in the e-Government survey, surpassing over the world average and ranked 6th in ASEAN (after Singapore, Malaysia, Philippines, Thailand and Brunei) (United Nation, 2014). In the coming time, the Government of Vietnam needs to apply more technology products of the Fourth Industrial Revolution in building e-Government.

The Vietnamese government also needs to boldly remove regulatory policies in the field of internet and cyberspace. The very rapid transformation of business models in the digital economy has resulted in a number of Vietnamese legal regulations not keeping up. Instead of banning business activities that the Government cannot manage as in some cases in the past, it must boldly accept new business models and new technologies that fundamentally change industries, called X-Tech, such as Fintech (Financial Technology), EduTech (Educational Technology), AgriTech (Agricultural Technology),... There is a need for a new approach to management that many countries apply, called the Sandbox approach: what is not managed is not managed, for self-development but in a certain space, in a certain time so that the problems are clearly revealed. After that, new policies and regulations are formed for management. This is also the way of most other countries in the world because these new business forms are not only new in Vietnam but also all over the world.

For businesses, with technology-applied products, it will create a lot of value, reduce production costs, and reduce labor. Therefore, when knowing how to take advantage of opportunities from the digital economy, Vietnamese enterprises can improve production and business efficiency, expand markets and market shares, and even enter new markets due to created by Vietnamese enterprises. In particular, the digital economy will create a driving force for small and medium enterprises to develop more, becoming a key driver of economic growth. However, when starting to change, businesses need to anticipate

difficulties because according to many experts, 9 out of 10 business owners in the world start a digital transformation strategy, and out of 9 people deploy When launching this new business model, 7 people failed. Besides, although there have been a number of pioneering enterprises preparing to respond to technological changes, up to 82% of enterprises are still in new entry positions, of which 61% are still outside. and 21% of enterprises started to have initial preparation activities . The Covid-19 epidemic has dealt a heavy blow to the economy, the impact on all industries is undeniable. However, according to experts, from a positive perspective, it is the Covid-19 epidemic that is promoting the redevelopment of infrastructure, technology and workflow in the direction that everything moves to an online model. and technology, forcing businesses to undergo digital transformation more strongly than in the previous period. Especially when the social distancing order was issued, service shops all simultaneously sold only "take away" products, the stores closed and products from the counter were brought online. thoroughly. Supermarkets also simultaneously provide online delivery services, technology car companies also quickly launched new services such as "online shopping"... Some businesses in the real estate industry for projects project online, sell it through software, make a video to introduce the project to customers instead of watching it directly as before. In the current new context, with the rapid development of technology, in the future, new and more advanced economic models will appear, requiring businesses to have sustainable and long-term development to adapt. Vietnamese enterprises need to forecast and anticipate new business models in order to invest in research and apply technological breakthroughs to take advantage of this opportunity to thrive and be able to reach beyond the scope of their business. micro-country.

From the Government to every business, it must be seen that the process of digitizing the economy is a revolution in policy, in terms of macroeconomic development rather than a revolution in technology. The government will focus on perfecting the legal system for new technology application business models, and at the same time, cooperate with businesses to continue investing in upgrading digital infrastructure, public solutions, etc. digital technology to implement activities to promote the development of the digital economy.

Solution group on developing science and technology human resources in Vietnam

In the short term, an effective solution to develop human resources in science and technology is to recruit a team of officials and experts who are studying and working abroad. This is a team of highly knowledgeable human resources due to access to international education and working environment. However, in reality, most of the attraction and use of science and technology human resources is mainly done by private businesses and corporations, while the digitalization of the economy requires combination of government and business. To do this, the Government needs to develop a reasonable remuneration policy, from the system of wages, bonuses, allowances and other non-material incentives. This is one of the issues that human resources in this field are most concerned about today, when the remuneration policy is not satisfactory, the job cannot make full use of the knowledge they have accumulated during their studies. However, considering the country's economic conditions are still difficult, salaries are still low due to the limited budget, if there are no practical policies, especially in terms of opportunities, clear promotion roadmap. To retain talented people, they will move to work in non-state organizations with better income and working environment. Connecting, attracting and utilizing Vietnamese experts with science and technology expertise who are working for domestic corporations and enterprises or living and working abroad in various forms of cooperation, the link will bring high efficiency and save costs. Utilizing resources in these areas will reduce the payroll burden on the State Budget, while still promoting high-quality human resources for necessary jobs in the public sector. Many major powers in the world attach great importance to attracting scientific and technological human resources, especially talents from abroad to work, with special treatment regimes (high income, housing support, no

income, etc.) manage working administrative time, workplace but only need to ensure results, products... such as Singapore, USA, Japan...

In the long term, in order to meet the demand for human resources in science and technology in the context of the strong ongoing Fourth Industrial Revolution, the education and training system, especially vocational education, needs to be fast. quickly create a human resource that is highly adaptable to the Industrial Revolution, so that the Industrial Revolution is the foundation and root of human resource development. In particular, the structure of vocational training needs to be focused in the direction appropriate to the application of the digital economic model. Science and technology training programs need to be more towards socialization instead of being completely implemented by the State. Science and technology education associated with breakthrough technology products such as the Internet of Things, artificial intelligence, and robotics needs to be implemented right from low to high school levels, creating conditions for students to even Even kindergarten level access to this field as early as possible. Science and technology human resources are formed and developed from many different sources, but if you stick to the concept, most are trained in the national education system with the core being the higher education system. . It is a place to form and develop a team of science and technology human resources, especially experts, managers, professional lecturers, leading engineers, highly skilled workers, and qualified workers. research capacity or mastery of the transferred technology; has the ability to manage, propose and organize the implementation of solutions to effectively solve basic problems in the process of economic development. Therefore, training institutions across the country need to apply the achievements of technology to improve teaching effectiveness, equip learners with knowledge to master science and technology from basic to modern. Universities also need to promote training and practice linkages with the business sector in information technology application because the business sector is the unit that directly recruits and attracts this human resource as well as the industrial sector. The field has better potential and strength than other schools in developing professional skills and competencies for students and trainees at schools. In particular, young people are encouraged to pursue careers and fields closely related to science and technology through financial support, training funding, scholarships, and job search. This is a most effective and long-term solution that most countries in the world, even developed countries, still prioritize to implement.

Besides education and training solutions, it is necessary to overcome limitations from the State budget to create the best working environment and conditions for science and technology human resources. This issue not only has an impact on attracting and recruiting talent, but also plays an important role in retaining that talent to work long-term in Vietnam. Therefore, first of all, it is necessary to review the budget allocation ratio to be reasonable, to ensure appropriate remuneration for the workforce working in the field of science and technology; Creating conditions for science and technology human resources to devote their talents and enthusiasm and enjoy the fruits of creative labor, commensurate with the value of their contributions. Compared with other countries in the world, typically South Korea, China, and even Cambodia today all have effective policies in attracting and employing talents from abroad with incomes no less than that of other countries. developed countries (Hoang, 2020). However, salary and material incentives are only one issue, which science and technology human resources, especially scientists, are more concerned about than the environment and working conditions. They are not yet fully trusted to assign tasks, have autonomy in personnel and finance when conducting scientific research activities. In fact, for many years, the allocation of research funding in an average manner, spread without focus and not effectively managed has led to insufficient resources to invest in key research projects associated with practical needs of the country. From that situation, the Government needs to innovate strongly and comprehensively not only in recruitment and attraction work but also in the aspect of effective and reasonable recruitment and use of talents.

In addition, the creation of digital human resources with non-human factors such as robots,

AI, etc. needs to be identified as one of the focuses for breakthrough development. We can import technology, attract high-quality FDI to increase capital and technology associated with digital human resources. Along with that, Vietnam needs to have a start-up and innovation strategy with the encouragement and focus on research into automated, robotic, and AI technologies to supplement its own special and extremely important human resources. important in the world of the present and the future of this Industry 4.0 context.

Conclusion

In the past time, the Party and State have always encouraged, promoted and supported the development of science and technology human resources to meet the needs of digital transformation in Vietnam. This is not only a unique trend in Vietnam but also a general trend of the whole world if a country does not want to be left behind. However, compared to the region and the world, human resources for science and technology in our country are still limited in both quantity and quality. Therefore, solutions and strategies in the coming time including short, medium and long term are urgent requirements for Vietnam to ensure the effective development of science and technology human resources to serve the country, socio-economic development of the country.

To meet the country's digital transformation requirements and global trends, Vietnam needs to focus on science and technology human resources, including digital human resources; Human resources not only exist as actual people, but also need to pay attention to human resources of technology, machines, robots, AI, etc. In fact, countries that grasp and master technology will has the opportunity to develop rapidly at a speed far beyond and set a precedent for the development of human history. Along with that, the research and policy proposals will make timely and effective adjustments, bringing development investment to individuals, organizations and the whole society. If organizations, businesses and individuals well implement the above recommendations, Vietnam will realize the Party and State's goal of rapid and sustainable development of the country.

References

[1] Cisco. (2019). *Cisco APAC SMB Digital Maturity Index.* USA: Cisco.

[2] Dung, P. X. (2018). *The fourth industrial revolution - the revolution of convergence and savings*. Hanoi: Science and Technics.

[3] *Government. (2020). National Digital Transformation Program to 2025, orientation to 2030. Hanoi.*

[4] *Giang, N. T., & Tri, N. M. (2021). Human Rights Before the Impact of Industrial Revolution 4.0: Opportunity and Challenges. Turkish Journal of Computer and Mathematics Education (TURCOMAT), 12(6), 2231-2243. https://doi.org/10.17762/turcomat.v12i6.4829*

[5] Google, Temasak & Bain Company. (2020). *The e-Conomy SEA 2020 report* . https://economysea.withgoogle.com/

[6] Ha. H. (2018). Only 82% of Vietnamese enterprises are in a position to enter the Industrial Revolution 4.0, *Industry and Trade Journal* . http://tapchicongthuong.vn/bai-viet/chi-82-doanh-nghiep-viet-dang-o-vi-tri-moi-nhap-cuoc-cmcn-40-55974.htm

[7] Hang.T. T., & Hien, N. T. M. (2019). *State management in the digital economy. Journal of Political Theory, No. 6-2019.*

[8] Hoa, T.T.V. (2017). *Industrial Revolution 4.0 - Issues for socio-economic development and international integration of Vietnam*. Hanoi: National Political.

[9] Hoang. N. H. (2020). Developing digital human resources to meet the requirements of the digital economy. *Journal of Political Theory*. https://tcnn.vn/news/detail/48102/phat-trien-nguon-nhan-luc-so-dap-ung-yeu-cau-cua-kinh-te-so.html

[10] Liem, N.Q. (2020). Vietnam's science and technology in the context of the fourth industrial revolution for socio-economic development. https://nhandan.vn/dang-va-cuoc-song/khoa-hoc-cong-nghe-viet-nam-trong-dieu-kien-cach-mang-cong-nghiep-

lan-thu-tu-phuc-vu-phat-trien-kinh-te-xa-hoi-623415/

[11] ILO. (2016). *ASEAN in Transformation: How Technology is Changing Jobs and Enterprises* .https://www.ilo.org/wcmsp5/groups/public/---ed_dialogue/---act_emp/documents/publication/wcms_579564.pdf

[12] Institute of Scientific Information – ISI, Web of Science 02/06/2016. https://vi.wikipedia.org/

[13] IZI Solution. (2019). What is digital transformation? The situation of digital transformation in Vietnam. https://izisolution.vn/chuyen-doi-so-la-gi-thuc-trang-chuyen-doi-so-tai-viet-nam/.

[14] Microsoft Vietnam Communication Team. (2019). Asia Pacific GDP will grow by US$387 billion in 2021 thanks to digital transformations of the manufacturing industry. https://news.microsoft.com/vi-vn/2018/06/29/gdp-chau-a-thai-binh-duong-se-tang-387-ty-usd-vao-nam-2021-nho-vao-nhung-chuyen-doi-so-cua-nganh-san-xuat/.

[15] Phạm, L. (2019). Digital transformation is an operator. https://vnmedia.vn/cong-nghe/201904/chuyen-doi-ky-thuat-so-la-mot-hanh-trinh-630623/

[16] Schwab, K. (2018). *Fourth industrial revolution (ministry of foreign affairs and proofreading)*. Hanoi: National Political.

[17] Stross, R. (Hoang Thien translate, 2020). *Career Guidance In The 4.0 Era*. Hanoi: Labor.

[18] United Nation. (2014).E-Government survey 2014 – E-Government for the future. https://publicadministration.un.org/publications/content/PDFs/UN%20E-Government%20Survey%202014.pdf

[19] Tri, N. M., & Hau, D.T. (2020). Impact of industrial revolution 4.0 on education and training in Ho Chi Minh City, Vietnam. *Journal of Critical Reviews.* Retrieved from https://doi.org/10.31838/jcr.07.12.413

[20] Tri, N. M. (2020). Impact of Economic Growth on Social Security in Vietnam. *International Journal of Humanities and Social Science*. Retrieved from http://dx.doi.org/10.30845/ijhss.v10n3a9.

[21] Tri, N. M., *et al.*. (2020). Opportunities and challenges in promoting the role of international integration in the process of socio-economic development in Vietnam. *European Journal of Social Sciences.* https://doi.org/10.46827/ejpss.v3i2.796

[22] Tri, N. M., & Hoang, D.T. (2021). Enhacing the Quality of Teachers to Meet the Requirements of Industrial Revolution 4.0 in Vietnam: Problems and Solutions. *Ilkogretim Online*, 20(1). DOI: 10.17051/ilkonline.2021.01.87

[23] United Nation. (2014). E-Government survey 2014 – E-Government for the future we want retrieved 1 Mar 2021 at

[24] Vietnam Chamber of Commerce and Industry. (2020). Digital transformation: Solutions to help businesses overcome the COVID-9 pandemic and grow. *http://vbis.vn/chuyen-doi-so-giai-phap-giup-doanh-nghiep-vuot-qua-covid-19-va-phat-trien.html*

[25] Vietnamese enterprises. (2018). The 13 most prominent entrepreneurs under 30 in Vietnam in 2018.https://doanhnghiepvn.vn/13-doanh-nhan-duoi-30-tuoi-noi-bat-nhat-viet-nam-nam-2018-d125682.html

[26] Vietnam's Ministry of Science and Technology and CSIRO's Data61. (2019). *Vietnam's Future digital economy, towards 2030 and 2045* https://research.csiro.au/aus4innovation/foresight/

[27] Windpassinger, N. (2020). *Internet of Things (IoT): Digital transformation or death*. Hanoi: Information and Communication.