DEVELOPING DIGITAL HUMAN RESOURCES IN THE EUROPEAN UNION AND IMPLICATIONS FOR VIETNAM

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Summary:

The article analyzes the development of digital human resources in the European Union (EU) and suggests solutions for Vietnam. In the context of global digital transformation, the EU has developed many policies and strategies to improve digital skills for the workforce, from basic to advanced skills. The article also points out the major challenges that the EU faces, including the gap in digital skills, difficulties in retraining workers, and gender inequality in the technology sector. Based on the lessons of the EU, the author offers some suggestions for Vietnam on building a digital skills development strategy, promoting public-private partnerships, and narrowing the skills gap between regions.

Keywords: *Digital human resources; Digital skills; Digital transformation; Vietnam; Europe.*

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1. Introduction to digital human resource development in the EU

Digital human resources are the workforce with the ability, skills, and knowledge to use digital technology to perform tasks, jobs, and business activities in a digital environment. This concept is not limited to those working in the information technology industry. Still, it extends to all sectors, from manufacturing, healthcare, and education to finance and management, where digital skills are becoming essential. Digital human resources possess outstanding characteristics such as digital proficiency, the ability to think and make decisions based on data analysis and digital processes, and the ability to flexibly adapt to continuous technological change. In addition, they can also work remotely and collaborate effectively online, which is especially important in the context of increasingly flexible working (*World Economic Forum, 2020*).

According to the OECD, digital human resources are the workforce that possesses the necessary digital skills and knowledge to use and develop technologies in the context of the digital economy. The OECD emphasizes that digital human resources are not limited to the information technology industry but extend to all economic sectors, where digital skills become an

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important factor in improving productivity and work efficiency (*OECD, 2019*).

As for the EU, digital human resources are the workforce that can use digital technology to increase productivity and competitiveness in the digital environment. The EU focuses on the role of digital education and training in building a workforce that can meet the needs of the digital economy and contribute to the development of the digital society in Europe (*European Commission, 2020*).

The characteristics of digital human resources are that they are outstanding groups of workers with enhanced adaptability and efficiency in the digital economic environment. First, this group has proficient digital skills, including the use of basic software, digital tools, and complex technologies such as programming, big data analysis, and artificial intelligence (AI). These skills help solve their work quickly and optimize processes thanks to the application of modern technology. Digital thinking is a core factor, allowing digital human resources to make decisions based on data analysis rather than subjective experience. In addition, the ability to adapt and learn quickly is an important advantage. With ever-changing technology, they can continuously update new knowledge and promptly meet work requirements, promoting the digital transformation process in the organization. The ability to work remotely and collaborate online also gives them flexibility in space and time, using digital platforms to work effectively with colleagues wherever they are. Finally, the spirit of innovation and creativity helps them improve processes, enhance the quality of service, and create new value for the organization. These characteristics help digital human resources promote digital transformation and enhance competitiveness and sustainable development for businesses.

Therefore, digital human resources play an important role in promoting digital transformation, developing the digital economy, and building a digital society. In digital transformation, digital human resources are the main force carrying out digitalization and automation activities, from applying technology to restructuring work processes. The digital skills and thinking of these human resources help organizations optimize operational efficiency, improve product and service quality, and create competitive advantages in the digital market. In the field of digital economy, digital human resources are the core factor in applying technology to develop new business models, promote e-commerce, and create digital products and services. Thanks to the ability to analyze and exploit big data, it contributes to developing accurate business strategies, quickly meeting customer needs, and expanding the market. This not only brings higher profits to businesses but also promotes sustainable economic development. In a digital society, digital human resources contribute to building systems that connect, manage, and distribute online public services, from healthcare and education to public

administration. They not only play a role in implementing technological solutions but also educate the community on how to use technology effectively, helping to create a more inclusive, equitable, and convenient digital society for everyone. These contributions help improve the quality of life and promote social development in the digital age (*World Economic Forum, 2020*).

In the EU's strategy to promote economic and social development as well as maintain global competitiveness, developing digital human resources is one of the important issues. This also helps improve production processes, reduce costs, and develop new products and services for companies. On the social side, digital skills will narrow the gap between workers, increase access to information and services, and contribute to promoting social equality. Digital technology is playing an increasingly important role in everyday life, from education, and remote working to healthcare. The EU is in direct competition with technology superpowers such as the United States and China. Developing a digital workforce will not only help the EU maintain its competitive position, but also enable European businesses to lead in new areas such as artificial intelligence, robotics, and big data. These fields are considered the main drivers of the global digital economy and will determine the position of countries in the future.

Currently, the EU is facing many challenges in developing its digital workforce, especially the lack of digital skills among member states and different population groups. This shows a large gap in digital skills between member states, especially between the Nordic countries and Southern and Eastern European countries, where the proportion of people with digital skills is still very low. In addition, the shortage of highly skilled workers in advanced technology areas such as AI, cybersecurity, and big data is a serious problem. This situation not only affects the competitiveness of businesses but also hinders the digital transformation process of the entire region.

Overall, the EU has made great progress in developing digital human resources, but more efforts are needed to narrow the digital skills gap between countries and population groups. This requires strong investment in education and training, as well as appropriate support policies to create a digital workforce strong enough to meet the challenges of the future.

2. EU policies and strategies on digital human resource development

The EU has been implementing many important policies and strategies to deal with the challenge of developing digital human resources in the context of global digital transformation.

First, the EU Digital Skills Agenda was developed as part of the Digital Decade Strategy 2030 to meet the growing demand for digital skills. This Agenda program aims to train and improve digital skills for 80% of EU

citizens and create 20 million Information and Communication Technology (ICT) professionals by 2030 (*European Commission, 2022*). This program focuses on training the necessary digital skills, from basic to advanced skills, to promote the participation of workers in advanced digital technology industries.

Second, the Digital Skills and Jobs Coalition is an EU initiative to create a network of cooperation between governments, businesses, and educational institutions to improve digital skills. The Coalition acts as a common platform for parties to exchange ideas, implement training programs, and reduce digital skills shortages. In particular, the Coalition has implemented many practical projects such as the Digital Opportunity Traineeship program, which allows students and young workers to access internship opportunities in digital fields.

Third, the European Social Fund (ESF) is one of the EU's largest financial institutions, established in 1957. The European Social Fund supports human resource development and addresses labor market challenges. From 2021 to 2027, the European Social Fund Plus (ESF+) allocates EUR 99.3 billion, a large part of which is invested in developing digital skills for citizens, especially those at risk of being excluded from the labor market due to lack of skills. The projects supported by ESF+ often focus on reskilling and upskilling of existing workers, especially those in traditional occupations that are affected by digital transformation (*European Commission*).

Fourth, Horizon Europe is the EU's flagship research and innovation program. Horizon Europe, with a budget of EUR 95.5 billion from 2021 to 2027, has made an important contribution to the development of advanced technologies such as artificial intelligence (AI), cybersecurity, and Big Data. Part of Horizon Europe's budget is allocated to digital skills research and development projects, aiming to create new technological solutions and train a highly skilled workforce (*European Union, 2024*).

Fifth, the Digital Europe Programme is a EUR 7.6 billion program to directly finance innovation projects related to digital skills, including the development of advanced skills such as AI, cybersecurity, and high-performance computing. This program not only helps to promote technological development but also provides training for millions of workers.

Sixth, universities and educational institutions. Many universities and vocational training centers in the EU have been actively involved in providing digital courses and training programs. Universities not only teach basic computer science subjects but also partner with technology companies to provide in-depth courses in AI, big data, and cybersecurity. One example of that is the cooperation between universities and large companies such as Google or Microsoft in developing practical training programs to improve students' digital skills.

Seventh, Internship and vocational training programs. Programs such as the Digital Opportunity Traineeship have been implemented to provide internship and digital skills training opportunities for thousands of students and young workers. This not only helps them gain practical experience but also improves their employability in the digital technology sector. Vocational training centers also play an important role in providing short courses and digital skills training for adult workers.

Eighth, the role of EIT Digital. The EIT Digital Academy provides short courses and internships for learners, giving them access to advanced technology skills and hands-on experience with partner companies. It is a prime example of public-private partnerships to develop a high-quality digital workforce.

In summary, thanks to these strategies and programs, the EU is narrowing the digital skills gap and promoting employment in the information technology sector, laying the foundation for the development of the global digital economy. Funding entities and programs have expanded opportunities for people in member states to learn and develop digital skills, thereby improving the capacity of the workforce. Cooperation between educational institutions, businesses, and governments has built a strong educational ecosystem, meeting the demand for digital skills, and enhancing Europe's competitiveness in the international market.

3. Challenges in developing digital human resources in the EU

One of the biggest challenges in developing digital human resources in the EU is the digital skills gap between member states. The Digital Economy and Society Index (DESI) 2022 shows that Nordic countries such as Finland, Sweden, and Denmark have nearly 80% of their citizens with basic digital skills, while Southern European countries such as Greece, Italy, and Bulgaria have less than 40%. For example, Romania and Bulgaria have only about 28-31% of their citizens possessing basic digital skills (*Jasper Spanjaart, 2023*). This disparity not only makes it difficult to implement digital initiatives across the EU but also widens the economic development gap between member states. Countries with low levels of digital skills often have difficulty accessing the benefits of digital transformation, making them vulnerable to falling behind in the global technological competition. In addition, many Southern and Eastern European countries have difficulty providing the digital infrastructure and training programs needed to upgrade the digital skills of their workers.

The EU has recognized the importance of bridging the digital skills gap between countries through programs such as the Digital Skills and Jobs Coalition and the European Skills Agenda, which aim to support digitally less developed member states in terms of technological capabilities and workforce retraining. However, synchronization of strategies and funding

across countries remains a challenge. In addition to the disparities between countries, the EU also faces major challenges in training and upskilling its existing workforce. OECD (2023) points out that rapid technological change has made many traditional skills obsolete, forcing workers to constantly update and learn new skills. Many older workers or those working in traditional sectors have limited access to digital skills courses and retraining them is often time-consuming and costly.

Businesses, especially small and medium-sized enterprises (SMEs), also lack the resources to invest in upskilling their employees, especially in cutting-edge areas such as artificial intelligence, big data, and cybersecurity. Funding schemes such as the European Social Fund + (ESF+), have supported many projects to retrain and upskill their workforce. However, access to and use of these funds is uneven across countries, and some countries face difficulties in implementing effective digital training projects.

Digital transformation is radically changing traditional working models, forcing workers to face uncertainty in roles and new skill requirements. The emergence of working models such as remote working, the gig economy, and automation have changed the way work is done and require different skills, especially in traditional industries. Remote working requires workers to be proficient in using digital tools, self-managing their time, and communicating effectively online. The gig economy, with its flexible but unstable nature, requires the ability to adapt quickly and manage multiple tasks. Meanwhile, automation is replacing many manual labor positions, forcing workers in traditional occupations to learn additional skills in automated process management and data analysis. However, current training systems have not kept up with these changes, while vocational and university training programs still focus on traditional skills, thereby creating a large gap between actual needs and the skills that workers are equipped with (*European Parliament, 2024*).

The challenge in developing digital human resources in the EU is the lack of coordination between stakeholders such as government, businesses, and educational institutions. This lack of synchronization has led to the implementation of ineffective policies and training programs that do not meet the needs of the labor market. Governments often design training programs with long-term goals but do not promptly reflect specific and rapidly changing requirements from the market. Businesses, meanwhile, need human resources with specialized digital skills but cannot find them due to delays in updating training programs from educational institutions. As a result, many students after graduation do not meet the requirements of businesses, creating a growing skills gap. This lack of connectivity and coordination not only slows down the retraining process but also creates an imbalance between the demand and supply of digital human resources, directly affecting the development of the EU's digital economy (*CEDEFOP, 2021*).

Another important challenge is gender and gender equality in the information and communications technology (ICT) sector. According to Eurostat (2018), only around 17% of the ICT workforce in the EU is female (*EIGE*). This proportion is even lower in areas such as artificial intelligence and software engineering, where women face many barriers to entry. Gender inequality in the ICT sector not only reduces opportunities for women but also creates serious imbalances in the digital workforce. These barriers often stem from a lack of education and training programs specifically for women in digital skills, as well as a lack of women in leadership roles in the technology sector. The EU has launched several initiatives such as Women in Digital and programs to promote women's participation in the ICT sector. However, these initiatives have not yet created significant change and further measures are needed to encourage more women to participate in advanced technology sectors.

In summary, the challenges in developing digital human resources in the EU include large gaps in digital skills between countries, difficulties in retraining the workforce, and gender inequality in the ICT sector. To achieve the EU's Digital Decade 2030 goals, more comprehensive and synchronous solutions are needed to improve digital skills for all social classes, narrow the gap between member states, and promote gender equality in the technology sector.

4. Experience in digital human resources development in some EU countries

Many EU countries have developed effective digital skills training models and programs, which play an important role in improving the digital capabilities of the workforce, thereby contributing to enhancing global competitiveness.

Finland is one of the pioneers in developing digital human resources, thanks to comprehensive policies, public-private partnerships, and many innovative training programs. The Finnish government has implemented a National Digital Education Strategy, which integrates digital technologies into education from primary to university levels, along with a national digital employment and skills policy, to promote lifelong learning and improve digital skills for all citizens, helping workers to adapt to the digital labor market. However, Finland also faces several challenges such as a shortage of highly skilled workers in the fields of information technology and artificial intelligence, a digital skills gap between groups of workers, and the rapid speed of technological change. To address these issues, several programs have been launched, such as Elements of AI (a free online course on artificial intelligence from the University of Helsinki and Reaktor) to increase AI knowledge in the community; Digital Leap Program to support small and medium-sized enterprises in adopting digital technologies; Learning at

Work, which encourages employees to learn at work; and National AI Program AuroraAI, which promotes the AI application in the public and private sectors. Finland has shown success in combining educational policy, business support, and lifelong learning initiatives, that help the country maintain its leading position in digital human resources in the context of globalization and the digital economy (*Helsinki, 2023*).

For Estonia, innovative policies and digital skills training programs are diverse. The Estonian government has implemented the Estonian Digital Agenda, integrating digital skills from primary school with such subjects as programming, data analysis, and computational thinking, to help people get acquainted with technology at an early age. In addition, the digital employment and skills training policy supports retraining and upgrading digital skills for workers to meet the growing demand for human resources in the information technology, finance, and public services sectors. Despite that, Estonia still faces several challenges such as a shortage of highly skilled workers in such areas as cybersecurity and artificial intelligence, a digital skills gap between population groups, and rapid technological change. In response to these challenges, Estonia has implemented a series of programs such as e-Estonia, an initiative to build a fully digital society with online public services; ProgeTiiger, which provides programming education for students from primary to secondary school; Digital Innovation Hubs, which supports small and medium-sized enterprises in adopting digital technologies; and Work in Estonia, which attracts international talent to supplement the domestic workforce. Estonia's experience shows that a comprehensive strategy from digital skills education to business support is needed to develop digital human resources, helping the country maintain its leading position in digital transformation and promote digital economic growth (*Educationestonia, 2021*).

Germany, meanwhile, has many comprehensive policies and support programs to meet the needs of the digital economy. The German government has issued a national digital skills strategy policy (Digital Strategy Germany), emphasizing the development of digital skills for the workforce, and expanding digital education from schools to businesses. Germany focuses on training and improving digital skills not only in technology fields but also in traditional industries, helping workers adapt to new technologies. Like the two countries above, Germany also faces challenges such as a shortage of highly skilled workers in high-tech industries and a digital skills gap between regions. Therefore, Germany has implemented many programs such as Digitalpakt Schule, a large funding program to improve digital infrastructure and skills in schools; DigiHub, the centers to support small and medium-sized enterprises in applying digital technology; and AI Campus, an artificial intelligence training program for both workers and students, helping to improve competitiveness in the field of advanced technology. Germany

needs a diverse and sustainable digital skills training system to develop digital human resources, help the economy adapt to technological changes, and improve national competitiveness (*Helen Sibum, 2021*).

From the experiences of Finland, Estonia, and Germany, developing digital human resources requires a comprehensive and multi-dimensional strategy, including digital education policies, business support, and continuous skills training initiatives. These countries all focus on integrating digital skills into the education system from an early age, promoting lifetime learning and retraining workers to adapt to new technologies. In addition to successes, all three countries face common challenges such as a shortage of highly skilled workers, a digital skills gap between population groups, and rapid technological change. The experiences of these countries are clear evidence of the importance of policies to support digital skills development, helping the economy adapt quickly to globalization and digital transformation trends.

5. Lessons for Vietnam in developing digital human resource development policies

In recent times, Vietnam has issued many policies and strategies to promote the development of digital human resources, but it also faces many challenges on the path to building a digital economy. In terms of policy directions, Resolution No. 52-NQ/TW of the Politburo in 2019 laid the foundation for the development of a digital economy and society, emphasizing the improvement of technological capacity and digital skills for people, especially the labor force. This resolution sets a target that by 2025, Vietnam will have about 1.5 million IT and digital technology workers, meeting the requirements of modern industries. Then, the Prime Minister approved the National Digital Transformation Program for 2025, with a vision to 2030 (Decision No. 749/QD-TTg dated June 3, 2020), focusing on training and developing digital human resources, establishing innovation centers, and promoting public-private partnerships to improve digital skills for workers and the younger generation. In addition, Decision No. 146/QD-TTg dated January 28, 2022, of the Prime Minister approved the Project "Improving Awareness, Popularizing Skills and Developing Human Resources for National Digital Transformation to 2025, with an orientation to 2030". This project aims to create a strong change in the awareness of agencies, organizations, and people about digital transformation, popularizing digital skills, and improving the quality of digital human resource training in each industry and locality, towards sustainable development of the digital economy.

However, Vietnam still faces challenges such as a shortage of highly skilled human resources, especially in the fields of information technology, artificial intelligence, and cybersecurity. Although educational institutions have made efforts to train, the number of high-quality human resources has not yet met

the demand. The digital skills gap between regions and localities also causes a large difference in qualifications and access to technology opportunities, especially in rural areas. The rapid pace of technological change also makes it difficult for many workers to continuously update their skills, which requires flexibility in training programs. In general, although there are specific orientations and policies for digital human resource development, Vietnam needs to continue to improve its training strategy and promote cooperation to better meet the needs of the digital economy and maintain national competitiveness.

Vietnam, with its growing economy and increasing integration into global value chains, can learn a lot from the EU's digital human resource development models and policies.

Firstly, promote early digital skills education: Renewing education and training, which focuses on developing high-quality human resources to meet the requirements of the Fourth Industrial Revolution. This is similar to the strategies of Finland and Estonia in integrating digital skills education into the curriculum from primary school.

Secondly, develop a lifelong training policy: Vietnam will popularize 4G/5G mobile network services and smart mobile phones; at the same time, the proportion of the population with electronic payment accounts will reach over 50%. This requires people to be continuously equipped with digital skills and are in line with the lifelong training policies of Germany and Finland. Develop diverse digital skills training programs, from basic to advanced, like the strategies of Germany and Finland in building a richer educational ecosystem.

Thirdly, reducing the digital skills gap between regions: The National Target Program on New Rural Development for the 2021-2025 period, including the development of information technology and communications infrastructure, aims to narrow the digital gap between regions, is in line with the EU's experience in reducing the digital skills gap.

Fourthly, public-private partnerships: Encourage private sector participation in the development of digital infrastructure and services, which is like the public-private partnership model in Estonia's "Digital Innovation Hubs" initiatives.

Fifthly, like the situation in the EU, the rate of women participating in technology industries in Vietnam is still low. Therefore, Vietnam can encourage women's participation in the digital sector through initiatives, such as Women in Digital in the EU, which eliminate gender barriers in the ICT sector.

In short, Vietnam needs to develop a comprehensive strategy, learn from successful models in the EU such as the public-private partnerships model,

integrate digital education into training programs, and encourage women's participation in technology industries. Upgrading the digital skills of the workforce is a key factor in promoting the digital economy and ensuring global competitiveness in the future.

6. Conclusion

Developing digital human resources is an important factor in the digital transformation process of countries, including the EU and Vietnam. The EU has built a synchronous and diverse policy system to train and improve digital skills for the workforce in all fields and ages. Countries such as Finland, Germany, and Estonia have all been successful in implementing digital skills education models from primary school, promoting public-private partnerships, and encouraging lifelong learning. At the same time, they have faced and gradually overcome challenges such as the shortage of highly skilled workers, the digital skills gap between regions, and gender inequality in the technology industry.

Vietnam has demonstrated its determination and vision to develop digital human resources to meet the requirements of a rapidly growing digital economy. However, implementing and learning from international experiences is necessary to achieve the best results. Vietnam needs to continue investing in early digital skills education, promote public-private sector collaboration, support gender equality in the technology industry, and develop a sustainable education ecosystem. Learning from advanced countries will help Vietnam not only narrow the digital skills gap but also enhance its international competitiveness, ensuring sustainable development and effective integration into the global economy in the digital age./.

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