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DEVELOPING INFORMATION TECHNOLOGY HUMAN RESOURCES TO MEET DIGITAL TRANSFORMATION FOR SMEs IN VIETNAM

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The digitalization of businesses in general and small-and-medium enterprises (SMEs) in particular is probably one of the best options to develop business and increase the competitiveness of both Vietnamese enterprises and the country economy in the era of Industry 4.0. At the same time, it requires a change in the demand for high quality human resources (HR) competencies. This article aims to introduce the phenomenon of business digitalization in the literature, explore its current key benefits and risks, and analyse its influence on HR competencies. The research methods chosen to deal with a scientific problem in the theoretical part include an analysis of literature sources, systematisation, synthesis, generalisation, and comparison. The status of the research findings shows that digitizing Vietnamese enterprises is an inevitable trend; however, there exist challenges in its implementation, including national database system access, legal regulations and especially shortage of skilled human resources. The results also confirmed the importance of digitalization for human resources and the increasing demand for digital skills especially for SMEs in IT industry in recent years.

Key words:**Digitalization, SMEs, Industry 4.0, Digital transformation**

1. An introduction to SMEs

Concepts

Althoughbeing a widely used concept, thereare no standard definitions or unified criteria forSMEs.In fact, countries all base on the number of regular employees, capital size, annual revenue and the enterprise's total assets.

According to the criteria of the World Bank, a micro-enterprise is an enterprise with fewer than 10 employees, whereas a small enterprise has a number of employees from 10 to less than 200 and a capital of 20 billion or less.A medium-sized enterprise has 200 to 300 employees with a capital of 20 to 100 billion dongs (World Bank Group, 2021).

Table 1: Regulations on SMEs in some countries
(Foreign exchange rates according to VCB on July 28th, 2021)
(Unit: Person, USD)

Country	Staff headcount (less than)	Asset value (less than)	Turnover (less than)
USA, all sectors	500 or 1,000	Not important	Not important
Japan Wholesale	50	92,000	

Retail Service Manfacturing	100 100 300	992,000 460,000 2,767,000	Not important
EU	250	31	46
South Korea Construction Trade-Service	 300 50	 600,0000 250,0000	 1,400,000
Indonesia	Not important	100,000	500,000
Thailand Manufacturing Wholesale Retail	 N/A	 5,700,000 2,800,000 1,700,000	 N/A

Source:Training Center for Elected Representatives, 2019

Vietnam did nothave any legislative documents on SMEs prior to 1998; therefore, each local government had its own regulations to manage and support SMEs.

On June 20th, 1998, the Government issued Official Letter No. 681/1998/CP-KTN on the strategic direction and policies supporting the development for SMEs in Vietnam. According to Letter No. 661, a business in industrial sector is an SME if it has a capital of less than VND 5 billion, equivalent to USD 387,600, and fewer than 300 labors, while one in trading sector is an SME if it has a capital of less than VND 3 billion, equivalent to USD 232,560 and under 200 labors.

The National Assembly of Vietnam issued the Enterprise Law in 1999 when the enterprises claimed a strong growth in number and a significant breakthrough.

According to Decree No. 90/2001/ND-CP on the manual of Enterprise Law 1999, SMEs are businesses that have a capital size not exceeding VND 10 billion and an annually average number of employees not exceeding 200 labors. In 2009, Decree No. 56/2009/ND-CP was issued to replace Decree No. 90. The Decree No. 56 specifies that SMEs are divided into 3 levels, including extremely small, small and medium.

On June 12th, 2017, the National Assembly of Vietnam issued the Law on Support for SMEs. The Government issued Decree No. 39/2018/ND-CP dated in March, 2018 on guidelines for law on support for SMEs. This Decree specified that:

- In the sector of agriculture, forestry, aquaculture, industry and construction: A microenterprise has 10 employees or fewer who pay social insurance. Its total annual revenue is not more than VND 3 billion or total capital is not more than VND 3 billion. A small enterprise has a number of employees of no more than 100 who pay social insurance, revenue of no more than VND 50 billion, and a capital size of no more than VND 20 billion. A medium-sized enterprise has a number of employees of no more than 200 who pay social insurance, revenue of no more than VND 100 billion, and a capital size of no more than VND 100 billion.

- In trade and service sector, a microenterprise has 10 employees or fewer who pay social insurance. Its total annual revenue is not more than VND 10 billion or its total capital does not exceed VND 3 billion. A small enterprise has a number of employees of no more than 50 who pay social insurance, revenue of no more than VND 100 billion, and a capital size of no more than VND 50 billion. A

medium-sized enterprise has a number of employees of no more than 100who pay social insurance, revenue of no more than VND 300 billion, and a capital size of no more than VND 100 billion.

The rolesof SMEs

Nowadays, SMEs are placed among the key components of the economy in both developed and developing countries. They are internationally known as the driving force based on their enormous contributions to Gross Domestic Product (GDP) and generating new employment. They are generally presumed as the leader of environmental sustainability, economic prosperity and innovation, particularly in the economy of developing countries such as Vietnam. Compared with other types of businesses, SMEs have their own outstanding features about business activities. SMEs are flexible in adapting the ever-changing market, easy establishment, low expenses, and quick returns, to name a few. In addition, SMEs can adapt easily to the market change and leverage local labor force. SMEs play an important role in expanding economy, creating careers, contributing to diversify the products, supporting economic development, and transferring the business structures (Nguyen, P.A. et al., 2020).

In fact, SMEs represents 90% of all businesses in EU (European Court of Auditors, 2019), around 98% in Japan and the US, and 96% in Asia-Pacific region (Enterprise Newspape, 2016).The overwhelming number of SMEs creates the majority of jobs for a country: about 60% in the Asia-Pacific region, 75% in Japan(Enterprise Newspape, 2016).SMEs are considered as an important source of state budget revenue through taxes and fees, accounting for 65% in the EU, over 50% in the US(Enterprise Newspape, 2016).

According to the White Book on Vietnamese Business 2019, there were 714,000 enterprises (Ministry of Planning and Investment, 2019), of which SMEs accounted for 98% contributing to 48% of GDP, 50% of eployment, and 31% of budget (Merchant, 2018) (78,000 enterprises have applied for being inactive or temporarily halted due to COVID-19 until July, 2020) (Stock Investment, 2020).Enterprises operating in the information technology field as of 2017 were 28,424, accounting for about 4% of the total number of enterprises nationwide, of which the number of software enterprises accounted for 30%, and service enterprises accounted for 43%.

Table 2: Number of registered enterprises operating in the field of IT industry
(Unite: Enterprise)

Type	2015	2016	2017
Hardware, electronics	2,980	3,404	4,001
Software	6,143	7,433	8,883
Digital content	2,339	2,700	3,202
IT service (not includingtrading, distributing)	10,196	10,965	12,338
Total	**21,658**	**24,502**	**28,424**

Source: Ministry of Information and Communications, 2020

Most Vietnam's SMEs operate in the trade and service sectors (81%). The rest operate in the industry and construction sectors (Tran Nguyen Tuyen, 2019).

As a resulf of a compact management structure, SMEs are often more dynamic and sensitive to market changes than large enterprises. When the needs of the market

change, SMEs can easily adjust, change machinery and equipment, then redirect production and business to quickly meet the new needs of the market in a short time.

Limitations of SMEs

While SMEs generally form the backbone of most economies (Andulkar, M.; Le, D. T.; Berger, U., 2018),SMEs face challenges from increased competition, the ability to adapt to rapidly changing market demand, technological change, and capacity constraints relating to knowledge, innovation, and creativity. For many SMEs, however, their potential is often not fully realized due to factors related to their small scale: i. lack of resources (finance, technology, skilled labor, market access, and market information); ii. lack of economies of scale and scope; iii. higher transaction costs relative to large enterprises; iv. lack of networks that can contribute to a lack of information, know-how, and experience of domestic and international markets; v. increased market competition and concentration from large multinational enterprises caused by globalization and economic integration; vi. inability to compete against larger firms in terms of R&D expenditure and innovation (product, process, and organization); vii. subject to "churning" and instability; and viii. lack of entrepreneurial zeal, capacity, and know-how (Naoyuki, Y. & Farhad, T., 2016).

Some of the strongest inhibitors to adopting (e-business) digital services and applications in SMEs are inadequate capabilities and limited resources to develop and maintain an e-business operation, limited information technology (IT) skills, low customer or supplier usage, and short planning horizons.

On the other hand, SMEs are agile, as they can be flexible in implementing projects and carrying out rapid openings. But there seems to be a lack of guidance for SMEs to implement DT in practice. Furthermore, it is important to understand that DT is not just about the technological dimension but also affects, for example, an organization's processes, culture, staff engagement, customer orientation, and business models (Stolterman, E. and Fors, A.C., 2004).

2. Digitalization of enterprises

Concepts

"Digitalization" refers to the action or process of digitizing analogue data into digital form digitalization, or "the changes associated with the application of digital technology in all aspects of human society"(Stolterman, E.& Fors, A.C., 2004).Personnel records, for instance, can be maintained in electronic formats using Microsoft Excel instead of hard copy files, thereby being easily managed by HR department.

Parviainen et al. (2017)defined DT specifically as changes in ways of working, roles, and business offering caused by adopting digital technologies in an organization, or in the operation environment of the organization. Digitalization can enable and create new business opportunities and business models, change the roles of operators in a value chain, and even dislodge existing businesses (Bouwman, H. et al., 2019).

Digitalization and digital transformation

According to Schwertner, K. 2017, digital transformation in businesses is "the application of technology to build new business models, softwares and systems that result in more profitable revenue, greater competitive advantage, and higher efficiency". Similarly, Benjamin Grab, Dr. Marieta and Roxana Maria Gavril (2019) emphasized the positive results of digital transformation on businesses' returns: "an improved cost position and efficiency". They also mentioned that "in order to achieve those targets, companies engage in activities

towards standardizing and automating business processes".

Liu et al. (2011) described digital business transformation as the integration of digital technologies and business processes in a digital economy. Likewise, Westerman et al. (2011)views digital business transformation as the adoption of technologies to radically improve the performance or reach of enterprises.

In terms of the definition of digital transformation from the perspectives of companies, it is the changing of the organization including the company's structure, departments' functions via the integration of digital technologies and new business models in order to improve effectiveness. Digital transformation is of paramount importance in the digital age and it will require fundamental changes on an organizational level. These changes are associated with the organization's different internal and external elements including humans, processes, structures and strategies. Several benefits of digital transformation with regard to businesses can be listed as: expense reduction, improvement in customer policy, operational system, better data analysis and security, increase in customer experience, expanded market, superior human administration, and precise market segmentation and so on.

According to Microsoft, "digital transformation marks a rethinking of how an organization uses people, data and process to create new values".

From the perspectives of the Vietnam's government, digital transformation has a huge impact and it has been considered as a fundamental policy of the Communist Party of Vietnam in the development orientation program in order for enterprises not to fall behind while ensuring a sustainable development. On June 3rd, 2020, following the decision No.749/QĐ-TTg of the Prime Minister, the "National digital transformation to 2025 and orientation to 2030" program was approved by the Prime Minister, identifying all the duties and solutions to create a foundation for the digital transformation process in Vietnam. Accordingly, the digital transformation in Vietnam is supposed to be carried out in three distinct fields, namely digital government, digital economy and digital society.

Digital business transformation is the process of integrating digital technology in order to build new business models, processes, software and systems that result in more profitable revenue, greater competitive advantage and higher efficiency.

The crucial parts of digital business transformation processes involve new digital technologies which include social, mobile, analytics, cloud and Internet of things (SMACIT).

Digital transformation means the process of changing from a traditional model to a digital enterprise by applying new technologies such as big data (Big Data), Internet of Things (IoT), cloud computing (Cloud) and changing the way of operating, leading, working processes, company culture.

The difference between "digital transformation" and "digitalization" is once data is digitalized, we have to utilize technologies such as AI, Big Data, IoT, and Icloud to analyze and change them to create another value. To sum up, digital transformation means analyzing and changing digitalized data to create new values.

As a result, digital transformation is a broader term than digitalization. Digitalization can be considered as the pre-development or beginning stage of a digital transformation.

A need for the digitalization of enterprises and SMEs

The information and technology revolution in the era of digitalization has stressed the significant importance of IT

application in businesses in order for them to acquire competitive advantages and innovation in the market. Raghunathan & Madey (1999) stated in their studies that the information revolution has recognized the strategic importance of integrating information systems to enable companies to gain and maintain a competitive advantage (Raghunathan, M. & Madey, G.R., 1999).

When the amount of information and documents is small, the company's employees can manually edit documents, store them in hard files, and easily use it without any problems when looking up. However, the situation does not remain same when the amount of information and documents is getting bigger. The traditional way as mentioned above will cause a lot of troubles for preserving, searching, and using, thereplus not making any e-transactions successful. The company needs to digitize information to store and exploit it on software (digitalization).

According to National Student Survey, NSS dated April 30, 2020, UPS delivery service received about 39.5 million requests from its customers every day. VISA card service processed more than 172.8 million transactions by cards within a day. Twitter had 500 million new tweets per day. That Facebook had 1.15 billion members created a huge mess of text data, files, and videos. The world as of 2003 only had about 5 billion gigabytes of data; however, in 2011, it took only 2 days to generate such amount of data, and in 2013 it took just 10 minutes. According to Intel, 1 petabyte of data is generated every 11 seconds, which is equivalent to a 13-year-long HD video. No one can store and exploit such a huge amount of information and documents in the traditional way, which shows the importance of digitizing.

As the whole world has digitalized, using computers and the internet to send, exchange and store information, SMEs cannot rely on only paper documents and direct communication; they need to create the ability to communicate through tools and electronic devices.

There is no need to go directly to the market, which is both time-consuming and cost-ineffective. The global network helps businesses find and exchange necessary information;

When the world has been covered by cyberspace, the exploitation of Big Data, IoT, Icloud, AI technologies and so on has become popular. SMEs need to seizethisgreat opportunity to adapt as quickly as possible instead of standing aside.

Digitalization and digital transformation are golden opportunities for Vietnam’s SMEs, who are mostly micro-enterprises (69%) having limited resources and mainly operating in the commercial sector (81%). They can quickly access the market and obtain enormously diverse information at a low cost without having tobuild a large database themselves. Digitalization and digital transformation will not only help SMEs save time and costs to develop and optimize products, but also assist business owners to make reasonable decisions in a right and quick way. Information and speed are the money of a business.

To successfully implement business digitalization, many factors are required: making a change in perception; having high determination of the government; building an appropriate institution, a complete database system in accordance with international standards; applying the achievements of Industry 4.0; training qualified human resources with real capacity, etc., of which training a high-quality human resource is the top prority.The reason is that, after all, people are still the most important resource and the first cause of success or failure.

3. Human resources for digitize and digitalization business firms

Technology associated with Industry 4.0 like Big Data, Internet of Things (IoT), Robotics, Additive Manufacturing offer many opportunities for manufacturing SMEs. There is a special focus on how to help the SMEs to develop the required human capital: workers with the right knowledge and competences to apply Industry 4.0 technologies. The required knowledge and competences are not exclusively digital but also soft competences:cooperation, networking, branding and teambuilding (EU, 2018),

In all partner regions, SMEs feel the need to develop Industry 4.0 skills and attract relevant personnel. Especially IT specialists are needed for the company's transformation into a digital age and in regard to purchasing new technologies and it systems. Information about IT specialists is an indicator of companies' degree of digitization and an analysis of Statistics Denmark states that innovation and more digitization require, that the company must have its own IT specialists employed. There is no doubt that the need for IT specialists is growing (Danske Regioner, 2018).

In 2017, the total of workers in the IT industry reach 897,338 people, which istwo time higher than that ofin 2013, including: workers in the Hardware Industry (677,222 people), accounted for 75%the total number of the workers in IT industry, which is 2.4 times higher compared to the statistics of the past four years. There are112,000 people working in the Software Industry, standing at 12%, whichis1.3 time higher than the figure in 2013. The number of employees in the Digital Content Industry is 43,538 while that of Information Technology services is 64,574 people, take up 5% and 8%, respectively

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Table 3: Statistics of Human Resource in 2020

Indexes	2015	2016	2017
The total number of workers	721,584	780,926	897,338
The number of employees in Hardware and Electronics industry	533,003	568,288	677,222
The number of employees in Software industry	81,373	97,387	112,004
The number of employees Digital Content industry	44,320	46,647	43,538
The number of employees IT services	62,888	68,605	64,574

Source: Ministry of Information and Communications, National Digital Transformation Program 2020.

If the total number of Vietnamese small and medium-sized enterprises in 2017 were about 700,000,each enterprise would have an average of only 1.3, 1.6 and 0.06 people working in the IT Industry,Software Industry and Digital Industry, respectively. It can be seen that, that number of IT workerswere too small compared to the real needs of enterprises. Of course, that calculation was just a vivid example. In fact, IT coroperations wouldhave more IT workersin comparison to the statistics for national average and so do software engineers, they mainly concentrated in companies specializing in IT, and therefore, many small and medium-sized enterprises will not have enoughskilled IT workforces.

The quality of human resources

According to the announcement of the Ministry of Education and Training, the ratio of training engineers in colleges and intermediate schools of Information Technology in 2018 was 50/30/70, which means out of five graduated IT students, three gained college degree.

According to the Ministry of Information and Communications, only about 27% of IT workers can meet the job requirements while others need additional training for at least 3 months (Ministry of Information and Communications, 2020). This is very worrisome, because the development needs in general and the demand for digitization and digital transformation, in particular, are now in need of qualified IT human resources, while the current IT training programs have not met the development needs of the society, especially in training high-quality engineers.

Based on a report of the Ministry of Information and Communications, by 2020, the demand for recruiting IT worker is one million people, it is estimated that after 2020, the demand for recruiting employing working in Software and information Technology Services is expected to increase, standing at 30,000 people (VTV news, 2019). VietnamWorks stated that 53% of information technology enterprises need to recruit 10 - 30% more workers, 26% of enterprises need to recruit 30 - 50 more employees and 8.7% of enterprises want to recruit more than 50% of IT human resources (Investment, 2019).

Viettel Corporation needs to recruit up to 500 IT workers a year for big projects in AI, Big Data, aerospace technology. In 2019, Vietnam Posts and Telecommunications Group needs 5,000 IT human resources, currently the supply can only meet about 50% and in the next 2 years, VNPT must re-train additional training over 10,000 people. Vingroup has signed cooperation agreements with more than 50 leading universities in Vietnam and "orders" universities with a commitment to receive about 100,000 information technology graduates within next 10 years. VietnamWorks also said that, in the past 3 years, the number of jobs in the information technology industry has increased by an average of 47% per year. However, the number of employees in this industry has only increased by an average of 8% a year. If the gap between supply and demand in the coming years remains, Vietnam will increasingly lack human resources to meet the leading industry in this recruitment market.

Not only Vietnam, other countries with developed economies also have a shortage of IT workers. Japan needs to import about 30,000 more IT engineers in the next 4 years, especially from Vietnam. In 2020, the EUis estimated to be short of about 913,000 IT positions. Many countries such as the US, China, and India are also expected to be short of hundreds of thousands of IT engineers and programmers in the coming years, are having to improve their training programs in digital technology and implemented many policies to attract information technology human resources from all over the world to work in their countries (Saigongiaiphong newspaper, 2019).

The average salary of Vietnamese workers

According to the General Statistics Office, the average income per capita of Vietnam is about USD 3,000 a year (Tuoitre newspaper, 2019); the average income of IT workers in Vietnam is much larger than the national average, from USD 4,452 to USD 7,570/labor/year.

High income and ease of getting a job compared to other fields are the advantage for the human resource training institutions for information technology, exellent students will register for theITy training schools. This is an

important factor that determines the quality of human resources in information technology.

Table 4: Average income of Vietnamese workers in the field of information technology

	2015	2016	2017
Average income of 01 employee in the field of Hardware and Electronics	2,859	3,866	4,452
Average income of 01 employee in the field of Software	6,215	6,849	7,570
Average income of 01 employee in the field of Digital Content	6,120	6,189	6,737
Average income of 01 employee in the field of IT services	5,376	5,609	5,909

Source: TuoitreNewspaper, 2019

4. Training human resources

According to the Ministry of Education and Training, by 2018, 153 over 235 universities in Vietnam are offering information and technology training, with an annual student intake of around 50,000, accounting for nearly 10% of the total enrolment over the country – the highest rate compared to all training majors.

In 2019, 213 out of 663 colleges and 368 vocational schools provided information technology as well as electronics and telecommunications training with an enrollment of approximately 30 thousand students a year for colleges (in 2018 it was 28,633) and nearly 70 thousand a year with vocational schools (in 2018 it was 67,673).

Some universities owned by enterprises such as PetroVietnam University or FPT University are operating quite effective, because these universities are invested by enterprises with financial and technological potential. Besides, students are trained for the needs of enterprises and enterprises have the demand for employing students right after graduation. Results of research from universities and students are also transferred to enterprises quickly for application, without having to wait a lengthy time for procedures to be completed. This type of model is also being encouraged to be implemented under the Law on Higher Education 2019. Pioneering universities include the University of Science, Vietnam National University; Ho Chi Minh City University of Technology; Ho Chi Minh City University of Medicine and Pharmacy and recently the University of Social Sciences and Humanities under Vietnam National University Ho Chi Minh. Each university has 1 to 2 companies, Ho Chi Minh City University of Food Industry currently has 4 companies, and Nong Lam University in Ho Chi Minh City has 10 companies (Giaoduc&Thoi newspaper, 2020).

The corporate university model is the partnership between the universities and businesses in need of specialized training personnel. Enterprises provide aid for machinery and equipment, internship environments, engineers and employees to guide practice, and post-graduation reception for students. Universities are committed to providing training in accordance with the requirements that businesses order.

With this model, universities save the cost of investing in machines and equipment,

while students can learn on real machines and devices instead of models or theories and obtain work experience during their time at universities. On the other hand, enterprises can reduce recruitment and re-training costs after recruiting students.

5. Challenges to the development of high-quality human resource for the IT industry

Due to the rapid development of artificial intelligence (AI) technologies, the internet of things (IOT), and blockchain technology, Vietnam's information technology human resources are confronting numerous obstacles. Workers' necessary abilities must always evolve to keep up with the global division of labor, and skills for start-ups are unfamiliar to students and employees.

Information technology training has been heavily invested in a few schools with specialized training in IT, such as University of Science and Technology, National University, Institute of Posts and Telecommunications, and FPT University. Students are well-trained with high-quality programs, equipment, books, and teaching staff, and as a result, recent graduates are qualified to work in the field of information technology. For other universities and colleges which have IT departments, many graduates only know how to use computers to type, send emails and update news. If students want to have other capabilities such as installing software, security, they have to self-study, study at enterprises, workplaces or study at service centers.

It is incredibly wasteful for firms to spend a huge sum of money, roughly equivalent to several months' income for a new graduate, on computers that are primarily used for typing, sending emails, watching news, and playing games. Because the life cycle of computer and information technology goods is so short, it is required to re-equip another computer from time to time. This situation is identical to that of English training in Vietnam: all training institutions, from primary schools to universities, teach English, but most students who graduate from schools can simply greet and receive a certificate to serve the standardizing of cadres. The fact remains that not many students studying at foreign language universities are able to work directly in English. We do not deny what has been achieved through universalization of English and informatics, but it is very important to pay attention to the object of study, the purpose of each learner, and the quality of training, or else a significant social cost would be incurred.

The shift of information technology from an academic scientific and technological industry to a practical economic-technical one poses a significant challenge to the educational system. Many institutions take advantage of information technology training, but they don't accurately define the labor market sector for graduates, implying that they have not thoroughly researched the industry to comprehend market demand.

This demonstrates a significant disparity between university training and the needs of businesses for high-quality human resources in the field of information technology, resulting in waste for both employers and employees. Many schools still train students according to their capabilities but forget that training products need to meet the needs of the market, and students must be trained following what the market requires.

In the coming years, the demand for high-qualityIT human resources will be increasingly heavy, especially in the software industry. Businesses need qualified people, who are able to use advanced tools and technologies, collaborate in teams, have ambitions and passions, and are multilingual. If schools and

businesses do not have strong solutions, given the capacity of Vietnam's current system of training institutions, it is difficult to meet the requirements in terms of quantity, not to mention quality as the university output standards will still be much different from the business input requirements.

Many universities attract a large number of students to the information technology industry, but have not really paid attention to the quality of the teaching staff, enrollment, training programs, textbooks, and facilities. As a result, they are unable to develop a high-quality human resource as desired.

The requirements for updated knowledge of the information technology industry are always very high, while many current training institutions have not been regularly updated. Students can just get access to old textbooks and outdated documents while necessary reference books are lacking due to the shortcomings of electronic libraries in terms of the document quantity and accessibility.

As universities struggle to innovate new equipment and technology, knowledge and technologies related to Big Data, Artificial Intelligence (AI), Internet of Things (IOT), Block chain, and other topics have not been included in training programs. Not every institution has the funds or the will to invest millions of dollars in a practice room or simulation for a certain information technology major.

According to a report by the Ministry of Information and Communications, the percentage of information technology-trained staff in ministries is around 4%, in provinces approximately 1%, and only 30% of them are able to work (Ministry of Information and Communications, 2016). SMEs recruitment is even more challenging because most SMEs are micro organizations that cannot afford to invest large amounts of money in equipment, much less pay high salaries for IT engineers, and frequently do not employ IT experts for businesses.

From January to July 2020, 78,000 Vietnamese SMEs filed for bankruptcy, or stopped operating as a result of social distancing and border closures due to the Covid-19 pandemic. This creates great pressure and is also an opportunity for businesses to switch to a digital economy. However, data shows that many businesses are still not ready, despite the fact that they know they will have to switch eventually.

Ministry awareness is also a barrier to the growth of IT human resources and the digitalization of SMEs. The government has a solid policy in place for e-commerce, e-government, digitalization, and digital transformation as part of the fourth industrial revolution. However, ministries and branches have not been aggressive in developing IT human resources and digitizing SMEs due to objective causes such as lack of knowledge and subjective reasons such as a lack of investment funds.

Ministries' reports also only focus on staff managed by ministries and corporations, not to mention the large human resources of enterprises, especially SMEs, accounting for 97-98% of enterprises in the country. This is a significant challenge for SMEs in general, and for the development of human resources for SMEs' digitalization in particular. Digitalization and digital transformation for SMEs will be impossible if ministries are not completely prepared.

The quality of IT human resources is greatly influenced by recruitment, utilization, remuneration, and appointment: Company leaders are frequently persons who have received training in management, legal

specializations, and administration. Technical staffs and technological engineers mostly concentrate on professional aspects, making management and leadership jobs difficult for them to obtain.

Because Vietnamese people place a high value on celebrity, many people aspire to be selected to executive positions in businesses rather than having good competence.

As the Vietnamese value close relationships and bloodlines, they frequently recruit and relatives to leadership positions, and are hesitant to use talented people with whom they do not share close ties. This renders highly qualified employees unable and unwilling to assist, and it has resulted in an incompetent leadership team in some businesses, particularly state-owned businesses.

6. Suggestions

Through this article, the authors would like to make some suggestions so as to enhance the ability Vietnamese IT workforce in the upcoming years.

Increasing awareness about the role of digitalization for SMEs

Digitizing and digitizing businesses is an important tool for the development of enterprises in general and SMEs in particular. The success of business digitalization depends on many different factors such as the Government's determination, development policies, and laws, in which human resource is the decisive factor.

Businesses, especially SMEs need to understand, digitization and digital transformation is a huge opportunity for the existence and development of the business itself as well as the future of the country. It is necessary for businesses to be ready to invest in digital transformation for their sustainable development. Especially, investments in human resources would help SMEs gradually shift to an online model and computerize business activities.

Social distancing and the stagnation in international relations, especially the restriction of air services across global borders during the covid pandemic, which has been happening for more than a year now, has left serious consequences for the economy and human life. This is a vivid fact that helps us clearly understand the vital role of digitalization and digital transformation.

Reviewing the multi-level training model

Currently, IT workforce are trained at four levels - university, college, intermediate and vocational training. The reality shows that the boundary between college and intermediate level is not clear, both are applied training method. The distance between vocational training with intermediate level is unclear as the differences often lie in academic knowledge and practice. In particular, intermediate level offers less academic knowledge. The author suggests that only two types of training should be provided, university and vocational training so as to clearly affirm the difference between training forms, focus on training academic knowledge, combined with university practice and vocational training to have both good teachers and good workers, avoiding the current situation that is difficult to distinguish who is a teacher and which is a worker.

The current state organization model including state management, enterprises and centers, has a similar situation. It is difficult to understand why there should be centers; these organizations are neither enterprises nor a state management unit. In the past years, the center could use the state budget to operate, now it has begun to turn to self-reliance, but still mainly uses the government budget through tasks assigned by the State or bidding, without paying taxes or taking responsibilities like other firms,

which makes other businesses feel unfair. This type of model needs to change radically in order to achieve economic efficiency. There should be no hidden gaps in the models. It is essential to remove the central model and consider removing two or one training levels out of the four mentioned level.

Coordinatingall of resources for digitalization

Digitization is not the job of IT engineers and technology companies alone. Implementing digitalization requires the combination of many different human resources and organizations. Particularly, a technology engineer alone would not be able to digitalize the map data system as well as manage the natural resources and the environment at the same time. Hence, there is the need to coordinate with employees who have basic knowledge about drawing and be able to understand the parameters and different types of scales on the map and even know the minimum cost to draw the map as well. For example, the amount of money to draw a seabed topographic map with a scale of 1/10,000 can be four times higher in comparison with a 5/50,000 ones. Therefore, when implementing digitization and digital transformation, SMEs have to pay attention on training and developing not only high-qualified IT labor force but also other relevant human resources. Currently, Vietnam still experiences a shortage of human resources in some fields such as natural resource management, space planning, IoT, Blockchain…due to the lack of specialized training or lack of experience in training since some of these majors has just been being trained in the recent years.

Paying attention to the issue of labor remuneration

The salary for IT workers in Vietnam is much higher than Vietnamese average national wage index. However, compared to other Asian countries, the salary being paid for IT workers in Vietnam is only 13% of Singaporean, 35% of the Filipino, 47% of Malaysian and Thai, 64 % Indonesian, and 90% of Burmese (Gen.vn 2018).

In comparison with European and American countries, the difference is much larger. The UK's average salary for workers in the information technology field is USD 40,500/person/year while the payment is USD 108,000 in the US (GDAXX.com, 2018). In general, software engineers are paid by large companies from USD 118,000 to USD 159,000/year.

Table 5: The average annual salary of some big companies for software engineers

No	Names of the company	Average wage (USD/year)
1	Juniper Networks	159,999
2	Linkedin	136,427
3	Yahoo!	130,312
4	Google	127,143
5	Twitter	124,863
6	Apple	124,630
7	Oracle	122,905

8	Wal-Mart Stores	122,110
9	Facebook	121,507
10	Integral Development	117,927

Source: Evans data 2018

The large income disparity is one of the causes leading to brain drain on technological human resources, in the context that Vietnam still lacks highly qualified human resources.

Organizing Head-hunt events to recruit leadership positions

Leadership plays a very important role in the development of a business. In order to choose a capable and suitable leader for the business, SME firms should hold recruiting events to find the most suitable leader for their organization instead of doing a formal 5- or 6-step process. SMEs should learn from the experience of university entrance contests, beauty contests or music contests, maybe company have not selected the best, most beautiful, best singers, but the winners never now the worst. It is not advisable to prolong the situation that the appointment process has not been made, knowing who the director of the enterprise will be.

Setting up IT training system for children

The industrial revolution 4.0 and the future life of humanity are almost entirely dependent on digital technology, which leads to the idea that it is necessary to teach children from very young age, just like how English is being taught for all generations today, to create high-qualified IT human resources in the future. Of course, the trend of "follow- the- crowd-movement" must be avoided, regardless of the quality of training. Currently, it is very difficult to find computer training institutions for children in Vietnam, unlike English teaching centers. This is quite confusing.

Having a standard program for Vietnamese from primary to tertiary education

The Ministry of Education and Training needs to guide university, schools and business firms to develop a training and educational program that is built based on regional and international standards of information technology training, in order to have national orientation and consistency from ideas, objects, and contents, training program, to popularize informatics. However, the program should focus on training a team of labor forces that have the ability of absorbing knowledge and acquiring advanced technologies of the world, capable of practicing and developing IT industry of Vietnam.

Based on this framework program, training and education institutions can flexibly adjust, change and supplement some contents which are suitable with the characteristics of each institution and its trainees.

Strengthening the role of enterprises in training human resources

Information Technology workforce are trained to meet the requirements of businesses, so businesses themselves must participate more deeply in the training process and forecast to training institutions about the updated trend in labor market. Enterprises must be the measuring and thermometer of training institutions. Businesses also need to support training institutions and have a plan to recruit students who are still learning at school. The cooperation between schools and businesses will help the school have better conditions for equipment and meet the human resource needs of the market. In

return, businesses could find employees who are the right-fit to their organizations.

Joint linkage in training IT human resources

This type of linkage is essential for Vietnam, a country that does not have a starting point in Information Technology. This will help Vietnamese gain experience and practical knowledge from developed countries and quickly access the world advanced information technology, and therefore, reduce the high cost of study abroad.

Conclusion

Instead of epilogue, the author would like to quote VNETWORK's statistics on Vietnam digital 2020, published on February 19, 2020

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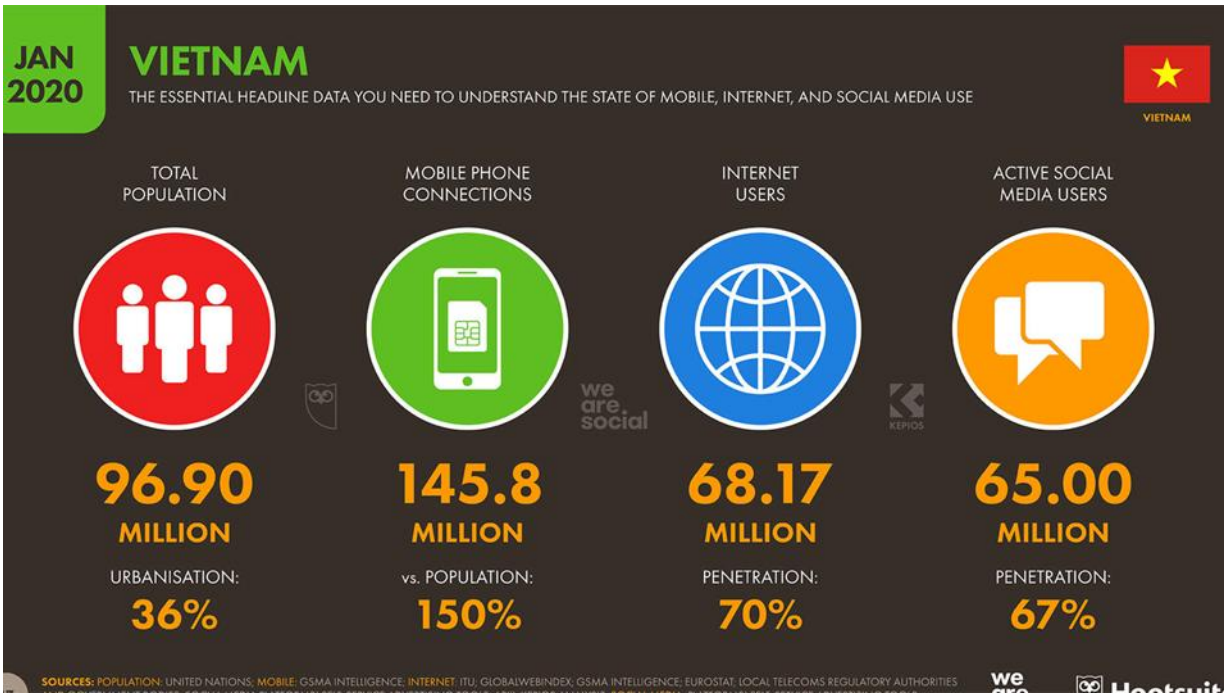

Source: The Network, February 19, 2020

According to statistics, the population of Vietnam in January 2020 is 96.9 million people, of which:There are 65 million people currently using social media for entertaining, keeping in touch with friends, and sharing moments, life hacks and even sales promotion. There are 68.17 million people are using internet services. The most impressive statistic reveals that Vietnam has are more than 145.8 million mobile data network connections by January 2020, equal to 150% of the population.

By looking at the above figures, it can be seen that there is a great demand of Vietnamese people for digitalization and digital transformation. In order to meet the requirements of consumers as well as country development, one of the things that business owners and managers have to do soon is to train and develop high-qualified IT workforce.

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