DOI:1056749/VSSR.3(220).59-78

Policy Solutions for Vietnam to Develop Digital Human Capital Resource from Singapore's Perspective

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Received on 20 February 2024. Accepted on 15 March 2024.

Abstract: Along with the promise of Industry 4.0, Vietnam shares common themes with Singapore in recognizing the vitality of digital transformation for nation-building. However, there is a big gap in human capital resource development for digital transformation between the two countries, which is a key factor in the great differences between their digital transformation successes. Based on analyzing and comparing key policies and programs for human capital growth and development for digital transformation between the two countries, this paper emphasizes that Vietnam can learn from Singapore in digital human capital growth and development for accelerating its digital transformation. Singapore demonstrates that human capital investment can pay substantial dividends, recognized as the heart of the country's development and a decisive factor in its digital transformation. This paper also emphasizes that for Vietnam to achieve its digital transformation ambitions, specific policies and programs need implementing on the one hand to equip the population with the appropriate digital skills to adapt to digital transformation, while on the other hand breakthrough policies and ambitious programs are needed to build a core team of digital talent.

Keywords: Singapore, Vietnam, digital human capital, digital transformation, the digital age.

Subject classification: Public policy.

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1. Introduction

Singapore is known to be a guru in promoting human resources and talent. This is widely recognized as the decisive factor that catapulted the island nation from a Third World country to the top First World country in the space of a generation since its independence in 1965. Today, Singapore continues to prosper in this Industry 4.0 era through maintaining its precious tradition in promoting digital transformation. In fact, in pursuing Industry 4.0 with a vengeance, Singapore has outpaced its competitors in deploying human capital investment in its digital transformation. This began in the 1980s with the National Computerization Program and has accelerated ever since 2014. Singapore has become the world's first and highest ranked Smart Nation, as evidenced in the World Bank's Human Capital Index in 2018 and 2020 (World Bank, 2021a). The country has started to benefit from its commitments. It is gradually realizing its ambition to become the world's first smart nation. Singaporeans and businesses are reaping the benefits brought by digital transformation.

Therefore, many elements of Singapore's model have become "conventional wisdom" for Vietnam's policy makers. Vietnam shares common themes with Singapore in recognizing the vitality of digital transformation for nation building. It is viewed as a key element in creating a new growth engine to propel Vietnam to becoming a high-income economy by 2045. The country has shown its commitment to digital human capital growth and development, and it is one of the first countries in the world to launch a national strategy for the development of digital government and a digital economy as well as a digital society. The National Digital Transformation Program in Vietnam represents a comprehensive and overarching policy framework aimed at advancing the country's digital capabilities across various sectors that recognizes the pivotal role digital human capital plays in the country's economic and social development.

This paper examines Singapore's key policies and programs for its digital human capital growth and development, and assesses their implications for Vietnam's digital human capital ambitions and solutions.

2.Literature review

Singapore's digital human capital growth and development has been nothing short of inspirational for policy makers, researchers, and global leaders. In fact, Singapore soon realized that developing an adequate digital human capital resource is a decisive factor in its successful digital transformation, and thus right from the

start, the focus has been on developing appropriate digital human capital resource to accelerate the process of national digital transformation, and hence realize the ambition of becoming the world's first smart country and achieving great success. Other countries can learn a lot from a number of studies on Singapore's experience in developing digital human capital resource for digital transformation.

Collectively, they can be divided into three main groups. *Firstly*, the research group on Singapore's institutions and policies in promoting and supporting the development of skilled and talented human resources ready for digital transformation. *Secondly*, the research group on Singapore's institutions and policies in promoting and supporting businesses in digital transformation. *Thirdly*, the research group on Singapore's institutions and policies in promoting the digital government.

Group 1 - typical studies include: Research by the Asian Development Bank (ADB) in 2021: "*Reaping the benefits of Industry 4.0 through skills development in Vietnam"*;

Research by PwC Vietnam (2021): "*Vietnam digital readiness report: PwC Vietnam's survey on technology, jobs and skills"*;

Research by the Center for Creative Leadership (2021): "*Digital leadership readiness: Lessons from Singapore"*;

And the research by Michael Fung (2020): "*Developing a robust system for upskilling and reskilling the workforce: Lessons from the SkillsFuture movement in Singapore"*.

These studies emphasize that developing digital human capital resource ready for digital transformation, especially regarding digital leaders, is extremely important when determining the success or failure of digital transformation.

Group 2 - typical studies include that the research by Joey Erh (2021) "*Assessing digital economy policies in six Southeast Asian countries"*;

Research by Ayman Falak Medina (2021) "*How Singapore is helping businesses accelerate digital transformation and expand overseas"*;

Research by Nguyen Huy Hoang (2020) "*Experiences of some ASEAN countries on digital economic development and implications for Vietnam*", and research on "*Singapore's experience of building synchronous institutions and policy recommendations for Vietnam*".

Research by the group of authors Pham Manh Hung and Bui Khac Linh (2021) "*The digital transformation journey of Singapore to build a smart nation and implications for Vietnam*".

Authors Pham Manh Hung and Bui Khac Linh, from the analysis and evaluation of Singapore's digital transformation journey to build a Smart Nation

along with the analysis and assessment of the specific context and actual conditions of Vietnam, believe that Vietnam has the opportunity to bring about great changes in digital transformation and catch up quickly with developed countries. However, it is difficult for Vietnam's digital transformation to speed up, achieve a lot, and make big changes with the country's current pool of human resources and talent. It is time to install specific mechanisms and policies to promote the development of a skilled and talented workforce to lead the digital transformation process.

Group 3 - with research by Ng Chee Khern (2019) "*Digital government, smart nation: Pursuing Singapore's tech imperative"*;

Research by Kelvin Lee (2021) "*How will Industry 4.0 and smart nation initiatives change our society in Singapore"*;

Research by Smart Nation and Digital Government Office (2018) "*Smart nation: The way forward"*;

Research by Pin Fen Fong (2019) "*Industry 4.0 for developing countries: Strategy and implementation"*.

The group 3 studies identified that when building digital government, a people-centered approach is needed to design products or services based on a citizen's needs. A new way of thinking and doing is needed to determine what issues people care about the most and how to increase convenience for them.

In particular, there have been a number of valuable lessons offered for Vietnam to develop digital human capital resource to accelerate its digital transformation. For instance, ADB (2021) studied Singapore's experience along with those of other ASEAN countries, including Vietnam. They assessed the policy landscape for harnessing the potential of Industry 4.0 in increasing productivity, facilitating skills development, and incentivizing the industry based on international benchmarks and examples.

The World Bank (2021b) found that Vietnam's digital sector could potentially reach over USD 200 billion by 2045, concluding that Vietnam has a good, but uneven, prospect of becoming a digital powerhouse. Vietnam lags behind in skills and this is holding the country back from fully realizing its digital transformation ambitions. There is a shortage of qualified workers in Vietnam, and the number of students registering in relevant postsecondary programs is insufficient to fill the gap. At the current rate, it will take 25 years for Vietnam to match Thailand's accomplishments. Many businesses report increasing difficulty finding and retaining good data analysts, programmers, and modelers. The World Bank also argues that Vietnam needs to enhance its digital skills to avoid increasing inequality (World Bank, 2021b).

Given the rapid pace of change and uncertainty about future job

requirements, the World Bank observes that collaboration between the Vietnamese government and the private sector could help identify and anticipate what skills are in most demand. The five complementary options further Vietnam's ambitions are: (i) nurturing young digital talent through a large-scale scholarship program to prepare students throughout their careers; (ii) developing programs that combine skills development for the digital economy, with financing and mentorship for digital entrepreneurs; (iii) introducing technology at early stages of education; (iv) attracting talent from the Vietnamese diaspora who are engaged in digital sectors around the world; and (v) encouraging the development of workers' soft skills, such as critical thinking and problem solving, communication, teamwork, creativity, management, and so on.

Based on Singapore's experience and analyzing the digital transformation in Vietnam, AlphaBeta (2021) finds that Vietnam's digital transformation, if fully realized, will most likely raise its annual economic value to USD 74 billion by 2030. Two critical factors in harnessing growth potential include: (i) developing the domestic technology ecosystem, and (ii) providing digital skills training for workers and students. To fully reap the benefits, it is critical to ensure that the workforce is equipped with digital skills to access job opportunities, run businesses, and enhance productivity. AlphaBeta opines that opportunities to access skills training should be available to all, including typically underserved communities such as ethnic minorities and people in economically distressed or remote regions. The seeds for a future adaptable and digitally skilled workforce must be planted early to ensure a robust talent pipeline (AlphaBeta, 2021).

3. Methodology

The authors gathered and analyzed the academic, popular, consultancy, bilateral and multilateral organizations, and consulted library and journal research databases, as well as policy papers, laws, regulations and other documents published by the governments of Singapore and Vietnam to form a balanced assessment of the two countries' digital human capital policies and programs past, present, and future. The authors aim to assess what policy lessons Singapore can offer Vietnam and how Vietnam might adopt some of these, while choosing its own path for growth and development. Most agree that there is no silver bullet necessary to achieve transformation, but that each developing country must find its own path.

A diagnostic approach was taken to understand and assess two important aspects of the digital human capital policy approach taken by Singapore and Vietnam: (i) "*the what*" that is the specific policies that have been designed and implemented by both countries; and (ii) "*the how*" i.e. the implementation

mechanisms. Specifically, what are the key policies Singapore is implementing, and how? What are some of Singapore's policies that Vietnam is following, and how? Are they good or bad? What policies is Vietnam not following and why? Is this good or bad? Then, drawing upon Singapore's policy experiences, recommendations are outlined to address current gaps in both policy and actions and enhance the effectiveness and efficiency of implementation mechanisms.

4. Research results and discussion

4.1. Singapore's key policies for digital human capital development

4.1.1. Overview of Singapore's policies for digital human capital development

Singapore is proactive in developing policies for digital human capital to ensure that its workforce is well-equipped to thrive in the digital economy. The country has paid special attention to, and maintained, a long-term vision, to guarantee its adequate digital human resources for digital transformation in a very practical, methodical and effective way ever since digital transformation began in the 1980s through the National Computerisation Program, which has accelerated since 2014. The development of digital human capital resources is a key part of the Smart Nation Initiative launched in 2014, catapulting the country to becoming the world's first Smart Nation. It provides new options for Singapore to overcome land scarcity and a limited population, helping it to grow; and it is part of Singapore's game plan to be a global Asian hub of technology, innovation, and enterprise.

Singapore has not only equipped its workforce with appropriate digital skills undergirding the current and future job markets, but also developed a digitally talented core team to lead the country's digital growth and development. It has also been proactive in attracting international professionals and experts who contribute to the country's technological advancements, maintaining its status as a global business, technology and innovation hub. Consequently, Singapore now has sufficient human capital resources for its national digital transformation into the world's first Smart Nation.

4.1.2. Policies for quickly equipping population with digital skills

Singapore is widely recognized as having a highly educated and well trained workforce. However, rapid technological advancements are transforming industries

and job requirements putting the country at risk of a serious mismatch between jobs and skills; an estimated one-fifth of its full-time workforce face job displacement by 2028 (HRM Asia, 2019). In fact, many traditional and emerging industries require employees to have a range of digital skills, from basic computer proficiency to advanced capabilities in data analysis, programming, and digital marketing. Moreover, an aging population, exacerbated by a shrinking workforce, creates an even greater need for Singapore to constantly refresh the digital skills of its workforce. Recent research concludes that digitally skilled workers are expected to see the largest skill needs by 2025, with a 58% share of the total digital skills training needs (AlphaBeta, 2021).

Recognizing the importance of a digital skills workforce for its economic development and technological advancement, Singapore has implemented several policies and programs to quickly equip its population with digital skills in order to remain adaptable and capable of leveraging emerging technologies, fostering innovation, and keeping ahead of industry trends.

The SkillsFuture national program launched in 2014 helps individuals realize their full potential, regardless of where they started out, enabling them to pursue their careers and interests. This is a comprehensive initiative that encourages them to develop skills throughout their lives, equipping the workforce with skills required by the digital economy. The initiative focuses on four key areas: (i) helping individuals make well-informed choices in education, training, and in their careers; (ii) developing an integrated, high-quality system of education and training that responds to evolving industry needs; (iii) promoting employee recognition and career development based on skills and capability; and (iv) fostering a culture of lifelong learning.

SkillsFuture Credit supports continuous learning and upskilling, providing Singaporeans with opportunities to develop the right competencies to thrive in a knowledge-based economy. Through this initiative, Singaporeans are given up to SGD 1,500 in credits to enroll in reskilling and upskilling courses. These cover various competencies, including data literacy, cloud computing, and digital problem-solving. Between 2016 and 2018, more than 285,000 Singaporeans had utilized their SkillsFuture Credit. In 2019 and 2020, 500,000 and 540,000 (respectively) benefited from the initiative's online and offline courses.

The SkillsFuture Funding Support for Employers was launched to help companies upgrade and reskill their staff. Eligible entities can receive up to 90% subsidies on training fees and absentee payroll for staff attending courses.

The Industry Transformation Maps (ITMs) was rolled out in 2016 across 23 sectors to help companies and Singaporeans in these industries identify future trends and manage industry disruptions. Together with ITMs, the Skills Frameworks originating in 2016 provides up-to-date information on employment,

career pathways, occupations, job roles, existing and emerging skills and competencies, as well as relevant education and training programs. Therefore, through this initiative workers can identify which skills they need to develop or hone in their current places of work, or different ones in which they wish to enter. Businesses use the Skills Framework to identify new jobs, equipping staff with the appropriate skills for digital transformation, while education and training institutions use the framework to design and deliver relevant training and programs. Singapore has developed more than 30 Skills Frameworks in sectors such as aviation, aerospace, electronics, financial services, energy and chemicals. A 2018 survey of over 700 firms in Singapore found that 36% take guidance on ITMs on how to improve their talent resource, and how to address manpower challenges in different sectors (ADB, 2021).

As a result, a recent study shows that today Singapore has a large digitally skilled workforce with 63% applying digital skills in their jobs, and about 22% at an advanced level - the highest among the Asia-Pacific (APAC) countries (Huawei, 2021). Workforce Singapore supported nearly 100,000 Singapore citizens in finding employment in 2020 alone, ranging from new graduates to mid-career converters.

4.1.3. Policies for developing a core team of digital talent

Key policies and programs to build a core team of digital talent for emerging technologies

Digital talent is in high demand across various industries, and by developing a core team of experts, Singapore aims to support the growth of the technology sector, and its positive spillover influences the broader economy. These individuals play a crucial role in researching, developing, and implementing cutting-edge technologies, to ensure the country remains at the forefront of innovation in areas such as artificial intelligence (AI), data analytics, and cybersecurity, etc.

Singapore's policies may be more targeted, aligned with a vision of becoming a global hub for specific emerging technologies, such as fintech, biotech, and AI.

Policies may be more sector-specific, focusing on industries where Singapore aims to be the global leader, such as financial technology, biomedical sciences, and smart manufacturing.

The SkillsFuture Series was introduced in 2017 to help the Singaporean working population attain these goals and emerging skills sets in the eight emerging areas of Cybersecurity, Data Analytics, Entrepreneurship, Finance, Tech-Enabled Services, Digital Media, Advanced Manufacturing, and Urban Solutions. This enables them to meet changing job demands and stay relevant and competitive.

Individuals can gain access to quality industry-relevant programs from over 400 courses at beginner, intermediate, and advanced levels. The SkillsFuture Series particularly benefits adult learners from different skills proficiency backgrounds (Government of Singapore, 2022).

Singapore has implemented the National AI Strategy to help the population keep abreast of advances in AI and be suitably qualified for future jobs. A series of AI talent development ventures has been implemented. In August 2020, under the TechSkills Accelerator (TeSA) initiative AI Singapore (AISG) launched "AI for Everyone" and "AI for Industry" in partnership with the Infocomm Media Development Authorit (IMDA) targeted at supporting 12,000 people acquire AI knowledge. TeSA aims to develop a constant supply of skilled tech professionals to drive Singapore's local tech ecosystem, especially in AI, helping businesses and their employees increase competitiveness through AI.

TeSA is an initiative under the SkillsFuture umbrella with the remit to build and upgrade the digital skills of the workforce. It targets professionals, managers, executives, and technicians in the technology sector, offering training courses, mentorship, and job placement assistance.

To develop digital talent for the ICM sector to be a key growth driver of Singapore's economy, the focus is on three strategies.

Firstly, to narrow the widening manpower gap through continuous training and work placement in emerging skills for ICM professionals. At the same time, the Singapore government scales up training efforts for infocom professionals and grooms Digital Leaders across SMEs.

Secondly, it will strengthen the skills of the current ICM workforce and collaborate with employers for upgrading and re-skilling programs. This will allow the ICM professionals to continually respond to the rapid development of technology.

Thirdly, to increase support for displaced workers and those at risk of displacement. For people who do lose their jobs due to restructuring, there is a plethora of courses and programs designed to help them develop new skills and improve their employability.

Key policies and programs to develop a core team of digital leaders in the public sector

The Government of Singapore is actively pursuing digital transformation initiatives to enhance the country's public services and governance.

A core team of digital talent is integral to these efforts as it enables effective implementation of digital strategies. Efficiency is improved, and the evolving needs of citizens can be met. It ensures the government has sufficient in-house digital capabilities on a par with top tech companies.

Singapore has made a big push for its public officers to adopt AI and acquire data analytic skills. In 2018, it committed to training 20,000 public officers (representing 14% of its public workforce) in data science and analytics, and broadening digitization within the government. The first target was met by the end of 2021; regarding the second target, all 20 ministries submitted plans to use AI in decision-making. New KPIs were set for 2023, which included requiring all public officers to have basic digital literacy skills and all ministry families to have at least one AI project for service delivery or policymaking (South China Morning Post, 2022).

The Smart Nation Scholarship was launched in 2018, offering attractive programs to develop and nurture talented individuals and potential digital service leaders in the public sector. This initiative creates new career opportunities in the digital age and promotes the participation of technology talent to benefit the community through public service. Graduates must commit to six years work on overseas projects or four years for domestic projects. After rigorous practical training, individuals can be placed in key leadership roles in Singapore's Smart Nation Initiative.

To leverage expertise outside the government, Singapore established the Smart Nation Fellowship Program to attract top data scientists and technologists to come to Singapore (for short to medium-term stints) to collaborate with the government on specific projects. Collaborating on digital or engineering solutions that will have an impact on people's lives, highly skilled and experienced professionals can benefit from attractive salaries and challenging and interesting work managing large technology projects over a three- to six-month period. Singapore offers attractive salaries, challenging, interesting and meaningful job designs to attract and recruit its high-caliber high-tech professionals with extensive experience in managing large technology projects to take a three- to six-month stint, to collaborate on digital or engineering solutions that will have an impact on people's lives.

Singapore has established a Center of Excellence (CentEx) for ICT and Smart Systems provided through GovTech to strengthen in-house digital capabilities. CentEx houses capability centers in Data Science and AI, Sensors and IoT, ICT Infrastructure, Applications Development, Cybersecurity and Geospatial Technology, and supports the rest of government in building technical capabilities. "To groom more technology leaders, Singapore established a government-wide ICT & Smart Systems scheme (ICT&SS) to allow qualified individuals to exploit their aptitudes and meet their career aspirations in this field". Through CentEx, Singapore will expand the pool of specialist individuals who can take advantage of technology opportunities. These Capability Centers are crucial in rebuilding the government's engineering capabilities, and are the reason why the government is able to in-source ambitious and socially meaningful digital projects.

Key policies and programs to attract global digital talent

Although the total population of Singapore is small (5.9 million), the country is a destination of choice for technology and innovative businesses with 80% of the world's top 100 technology firms having a presence there (AlphaBeta, 2021); thus the demand for digital talent is extremely high. Singapore recognizes the importance of attracting global talent to supplement its domestic workforce and thereby fill the skills gaps and ensure that the workforce has sufficient expertise to meet the demands of rapidly evolving technologies. A diverse and skilled labor force contributes to Singapore's ability to compete with other global technology hubs, attracting multinational companies, startups, and investment. It also strengthens its ecosystem, making it more attractive for businesses and investors seeking a robust and interconnected technology environment.

Several policies, including targeted measures, have been implemented to attract and retain top talent in critical emerging technology fields, enticing international professionals and experts, and contributing to Singapore's technological advancements. Hence, the country maintains its status as a global technology and innovation hub. For instance, in 2021 Singapore launched a two-year visa under the Tech.Pass Program to attract 500 technology experts from around the world. The program is only open to entrepreneurs and high-caliber technology experts with capital, networks, and knowledge. With a Tech.Pass they can work as managers, executives, consultants or in start-ups for Singapore companies without needing a work permit. The aim is to propel Singapore to becoming a regional and global technology and innovation hub.

The government incentivizes and supports companies that hire global digital talent. This includes tax incentives and grants to encourage businesses to establish and expand their operations in Singapore, contributing to job creation and talent attraction. The Singapore government also attracts overseas Singaporeans to return home by giving incentives and support, particularly in fields where domestic talent is scarce. The Singapore Tech Forum in the Bay Area was set up. It offers a great number of opportunities and introduces ways that the technology diaspora can join the public or private sectors in Singapore. This is considered one of the practical ways to attract short-term participation of the technology diaspora in Singapore's digitalization projects.

Advantages such as world class educational facilities, a strong technology base, a large presence of global technology corporations and venture capital funds, a strong startup ecosystem, billion-dollar R&D projects, large commercial networks, a favorable geographical location, an ideal living environment, and open immigration policy make Singapore an attractive destination for global technology experts. The right mix of foreign and local talent creates a fertile ground for innovation and an enterprising environment.

4.2. Vietnam's key policies for digital human capital development

4.2.1. Overview of Vietnam's policies for digital human capital development

Together with Industry 4.0, Vietnam undoubtedly stands to make substantial gains through digital transformation. A report in 2021 by AlphaBeta points out that digital transformation, if fully realized, could raise annual economic value to USD 74 billion by 2030. According to the World Bank, Vietnam's digital sector has expanded by 10% per year and could potentially reach over USD 200 billion by 2045.

Vietnam has certain prerequisites and advantages for developing digital human capital resources. The working population is highly motivated and hard-working (ADB, 2021), with good intellectual potential, being studious, quick to learn, adaptable, and having a strong desire to learn new skills. A report released in March 2021 by PricewaterhouseCoopers (PwC) indicated that the Vietnamese people's desire to be digitally savvy is strong with 84% of respondents saying they are ready to learn new skills or be completely retrained. This statistic is higher than 77% of global respondents (PwC, 2021). Vietnamese students performed relatively well on international assessments of students' science and mathematics skills. The country ranked eighth globally in its performance on science, with 16 points higher than the United Kingdom and 29 points higher than the United States, in the 2015 Programme for International Student Assessment (PISA).

In particular, Vietnam is emerging as a leader in IT talent in the global sourcing market with a young, educated population; about 70% of them are under 35 years old, and the literacy rate is over 98% among those aged 15 to 35 years (AlphaBeta, 2021). With a technologically savvy population and cultural preference for software engineering (Huawei, 2021), Vietnam already has over one million ICT qualified workers. Moreover, with a robust education system Vietnam is in the global top ten countries for the highest number of IT graduates, from 236 universities, 149 of which provide education for IT professionals, resulting in over 50,000 IT engineers entering the labor market each year (InformationWeek, 2022).

In pursuit of digital transformation, Vietnam has issued a number of important documents on digital transformation. On 27 September 2019, the Politburo issued Resolution No.52-NQ/TW promoting active participation in Industry 4.0. A document issued by the 13th National Party Congress defined national digital transformation as an important task associated with three main pillars: digital government, digital economy, and digital society.

Following documents produced by the Communist Party of Vietnam, the government has issued several important policies and decisions. Decision No.749/QD-TTg, issued by the Prime Minister, dated 3 June 2020, approved the National Digital Transformation Program towards 2025 and A Vision to 2030. This

initiative set ambitious goals for Vietnam to join the 50 leading countries in IT development by 2025. The Prime Minister's Decision No.942/QD-TTg, dated 15 June 2021, approved the E-government Development Strategy towards Digital Government in the 2021-2025 Period, with A Vision to 2030. The Prime Minister's Decision No.411/QD-TTg, dated 31 March 2022, approved the National Strategy for Development of a Digital Economy and Society by 2025 with the goal for the digital economy to contribute 20% of the country's GDP by 2025.

4.2.2. Policies and programs for digital skills development

Recognizing the importance of digital skills for economic development, Vietnam has issued a number of policies for upskilling and reskilling its workforce. There is a strong focus on ensuring the relevance and agility of education and the training curriculum to meet emerging skills needs. This can be seen in many efforts already undertaken across primary, secondary, technical vocational education and training (TVET), and tertiary programs to revise and strengthen the curricula.

Vietnam has relied on global technology corporations and international organizations to equip its current workforce with digital skills, particularly the vulnerable groups. Microsoft provided programs to help develop digital skills for Vietnamese youth, particularly those from disadvantaged areas; while an ICT curriculum provided computer access to more than 150,000 students and most importantly, the opportunity to learn digital skills (Huawei, 2021).

Google launched the Google Career Certificate program in 2018 and Google for Startups to provide 20,000 scholarships to student learners and mid-career professionals. This initiative collaborates with over 40 local universities and vocational institutions to allocate scholarships. Among them, 3,000 are available for online registration by individuals or candidates from business organizations via nhataiso.nic.gov.vn.

The International Organization for Migration (IOM) in Vietnam launched a project titled "*Supporting the Government of Vietnam in digital transformation of labor through vocational education and training*" to enhance the digital skills of Vietnamese youth, including migrant workers, and contributing to strengthening their access to online acquisition of digital skills. The upgraded online learning platform provides eight online, self-paced courses including two Microsoft-certified digital skills programs, soft skills, job applications, entrepreneurship as well as online marketing, cyber security and internet connection courses.

A thorough comparison and analysis of policies between Vietnam and Singapore shows that Vietnam's policies in key areas of digital skills development are limited in scope of policy and implementation mechanism.

Firstly, unlike Singapore, Vietnam lacks government initiatives and specific programs to equip the workforce with appropriate digital skills. In fact, so far Vietnam has not yet rolled out the Industry Transformation Maps and Skills Frameworks and thus there is no common language among industries, enterprises, educational and training institutions, and individuals. Without specific guidance, it is difficult for them to gain the right digital skills to adapt to digital transformation. A 2021 report by PwC points out that 84% of the Vietnamese employers who responded indicated a need for a skills framework to guide Industry 4.0 capability development; only 14% believed they and their employees had a clear view of the skills required for digital transformation (PwC, 2021).

Secondly, for effective skills and education programs, it is critical that all stakeholders are coordinated and aligned regarding these programs, the objectives, implementation mechanisms, and associated information. Regarding Vietnam, there is limited and ineffective collaboration between various stakeholders as an ADB research points out (ADB, 2021). Alignment within and between industry/industries, training and education sectors on the skills demanded and the training required appears inadequate. Collaboration between industries and academia is still piecemeal and there is a lack of coordinated sector level efforts to align key skills and qualification frameworks.

Thirdly, development of skills will require improving the quality of technical/vocational education programs. In Vietnam such training has begun to change but further transformation is needed to improve quality. The World Economic Forum ranks Vietnam 102nd out of 141 countries on the "quality of vocational training" in 2019.

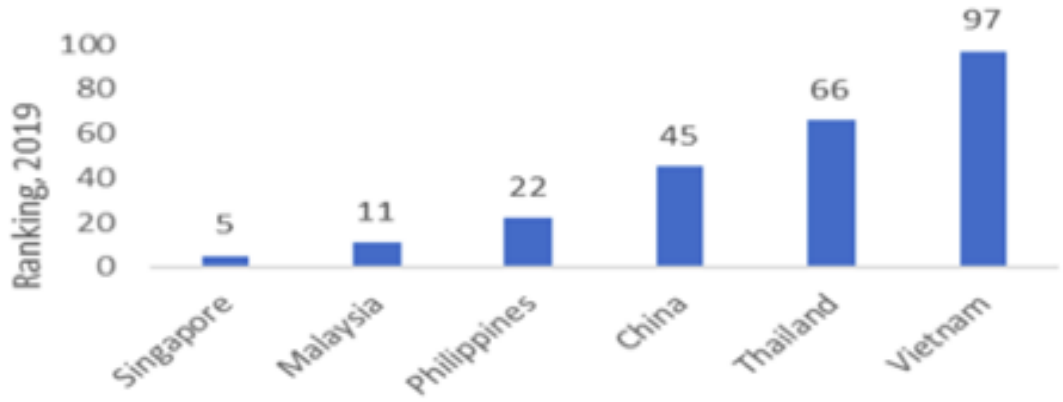
Fourthly, in contrast to Singapore, Vietnam lacks employer and employee incentives to participate in skills development and upskilling. To date, Vietnam has had no direct financing or incentives for digital skills development beyond efforts to upgrade the education system in general. Clearly, the active participation of employers plays a crucial role because success in reskilling and upgrading the capability of individuals depends very much on how willing employers are to give their staff time off to attend training courses. In addition, employer-led training efforts are limited. A recent survey showed that 68% of employers simply expect their employees to pick up skills as they go along at work (ADB, 2021).

It is necessary to financially support organizations and their employees with skills training as the latter may not be able to afford the cost of further education while businesses may be reluctant to train their staff for fear they could leave and join competitors.

It is worth noting that there is a huge requirement for digital skills development both in quantity and quality. In fact, unskilled human resources account for over 70% of the labor force. A significant number of workers - over

60% of those employed - are concentrated in family farming or household enterprises (World Bank, 2018) while the skills development system is limited and weak. A World Bank report in 2021 affirmed that there is a low number of suitably qualified individuals in the workforce. Postsecondary education and training programs have many limitations while the number of students registering in relevant postsecondary programs is insufficient to fill the gap. Vietnam lags behind its major regional competitors. At this rate, it would need 25 years to catch up with Thailand, let alone with Singapore (see figure below).

Figure 1: Vietnam Ranks at the Bottom of the Region in Terms of Digitial Skills Available in the Labor Force



Source: Jacques Morisset, 2021.

Vietnam's workforce is inadequately prepared for the digital economy; the World Economic Forum's Global Competitiveness Index 2019 ranked the country 97th out of 141 countries on the share of its working population with digital skills (AlphaBeta, 2021). Due to disruptive changes in technology and ever changing business needs, reskilling and upskilling are really challenging issues, so much that about 20% to 30% of existing jobs in Vietnam are at risk of transformation or being obsolete in the next few years (World Bank, 2021b).

4.2.3. Policies and programs for developing a core team of digital talent

Policies and programs to build a core team of digital talent for the ICT sector and emerging technologies

Undoubtedly, Vietnam has been focusing on fostering a talent base in the ICT sector and emerging technologies. Its ambition is to increase the nation's ICT workforce to 2-2.5 million over the next decade from one million currently. In fact,

Vietnam has introduced compulsory computer-related education for K-12 students to develop their digital skills. This starts with instruction in how to use basic productivity software such as word processing for students in earlier grades, progressing to learning about coding software in the later ones.

Vietnam's ICT sector faces a serious shortage of digital talent, particularly in emerging technologies because training programs in the ICT sector have yet to meet the increasing demand for high-quality digital human resources. According to a report in 2021 by AlphaBeta, Vietnam still lacks 500,000 data scientists and up to 1,000,000 ICT workers. In fact, Vietnam will need over 2,000,000 qualified individuals in this field between 2025 and 2030.This shortage of talent has been exacerbated by a brain drain with many local skilled workers going overseas. The Global Talent Competitiveness Index 2020, in relation to Global Talent in the Age of Artificial Intelligence, ranks Vietnam 96th out of 132 countries. There is also a clear mismatch between the quality of training and requirements of employers. Training programs fall short of the requirements of employers and the market as they lack practical application in higher education curricula.

There is also limited investment in developing adequate digital human resources through universalization of digital skills and upskilling/reskilling the workforce. In Singapore such investment accounts for 8% of government expenditure while in Vietnam it is less than 1%.

Policies and programs for digital leadership development in the public sector

Vietnam has said it would focus on training and fostering cadres, civil servants, and public employees. A number of directives, decisions, and policies have been issued. However, a thorough analysis and comparison of policies issued by Vietnam and Singapore shows that Vietnam's focus on digital leadership development in the public sector tends to offer only high-level guidance with limited specificity. There are no clear-cut, well-defined targets and guidelines to help civil servants upgrade their skills and keep pace with digital trends. Vietnam lacks specific policies and programs to nurture and develop digital leaders in the public sector, in the form of workshops, seminars, and courses that are tailored specifically for this sector.

4.3. Policy solution recommendations for Vietnam

4.3.1. Implementing specific policies and programs to rapidly equip the population with appropriate digital skills

Launching specific programs to raise awareness of the importance and benefits of having the right digital skills

Workers need to really understand that with the right digital skills they can exploit current and future technological advances and innovation of business models.

Workers also need to thoroughly understand that disruptive changes in technology and innovation in business models will lead to lost career opportunities, and certain skills will become irrelevant or obsolete. Embarking on a new career requires new skills, and whether or not one will have a good job depends on lifelong learning, constant self-improvement, and upgrading and developing new skills. In other words, employability depends more on these factors and having appropriate digital skills than one's initial qualifications.

Building a national skills framework

Digital skills may be new for businesses and their employees as well as educational and training institutions. It is therefore crucial to develop a National Skills Framework to create a common language for everyone. It needs to provide key information on career pathways, the existing and emerging skills required for different occupations, as well as reskilling options for different sectors. A list of skills upgrading programs also needs to be drawn up. The framework should serve not only employees, but also employers as well as educational and training institutions. Workers can use the framework to identify and develop new skills, enterprises can use it to equip their staff with the right skills for the digital transformation, while educational and training institutions can use the framework to design appropriate training programs.

Upgrading and motivating technical and vocational institutions

The current skills development system, especially the technical and vocational training one, needs reforming to improve capacity and efficiency. Technical and vocational institutions need to merge and transform into two-year vocational schools with sufficient resources and the capacity to run high quality training programs for enterprises, students, and the marketplace.

Competitive mechanisms need to be put in place to motivate technical and vocational institutions so that they compete with one another for training funding according to performance. Each year public and private educational and training institutions, seeking funding for training, must sign a performance agreement (with KPIs) with the National Steering Committee on Development of Digital Human Resources to agree on specific results, measures of evaluating results, and plans for completion. Performance will determine the outcome of funding. Educational and training institutions with excellent results will receive corresponding funding; those that do not achieve the required minimum results over two consecutive years will have their funding cut until they reach the prescribed minimum level or merge with more effective educational and training institutions. Thus, institutions shall make every effort to achieve outstanding results.

4.3.2. Implementing breakthrough policies and grant programs to develop a core team of digital talent

Building a core team of experts in emerging technologies

It is necessary to build a core team of experts in emerging technologies, such as the mobile internet, cloud computing, big data, AI, financial technology, internet of things, remote sensing, advanced robotics, and advanced manufacturing. These emerging technologies are the basis of Vietnam's booming digital economy (AlphaBeta, 2021) with the potential to create significant economic value for businesses and the government.

Vietnam should focus on attracting and recruiting its diaspora of digital talent. Clearly, due to historical circumstances, the Vietnamese diaspora is huge including hundreds of thousands of digital-talented Vietnamese scientists, experts, and engineers, living and working in countries with advanced science and technology capability. (Many Vietnamese work in some of the world's leading industrial corporations, universities, and research institutes.) This is the fastest way build a core team of experts in emerging technologies.

Building a core team of digital leaders in the public sector

A core team of public sector digital leaders is integral to these efforts. It enables the government to effectively implement digital strategies, improve efficiency, meet the evolving needs of it is citizens, and ensure sufficient in-house government digital capability, to exploit technology, analyze the workforce, determine their future needs and narrow the gap between the needs of today and tomorrow. Applying modern methods, such as data analytics and big data platforms, generates effective information for governments to strategically plan national digital talent policies; it also helps organizations scientifically formulate and accurately implement their talent policies and also helps fresh graduates consider their future career prospects.

The time has come for Vietnam to implement breakthrough policies and far-reaching programs to build a core team of digital talent, including those in emerging technologies, and digital leaders in the public sector able to lead the digital transformation. With innovative and strategic thinking, they can connect with, and exploit, global knowledge to make full use of advanced technology and innovation, and thereby able to solve Vietnam's and the world's big problems, and gain the upper hand in this fierce competition.

5. Conclusion

Singapore is clearly a role model for Vietnam in terms of digital human capital growth and development to accelerate its digital transformation. The island

nation demonstrates that human capital investment can pay substantial dividends, recognized as the heart of its development and a decisive factor in its digital transformation. Digital human capital resource development plays a key part in Singapore's Smart Nation Initiative launched in 2014, making it the world's first Smart Nation. Through this there are new ways for Singapore to overcome its land scarcity and limited population and contributing to Singapore becoming a global technology and innovation hub.

The Government of Singapore has shown a serious commitment to digital human capital growth and development. It implements strategic planning, a clear vision, and comprehensive well thought-through policies. The government acts as a catalyst to kickstart programs and initiatives allowing the majority of workers to gain appropriate digital skills, thereby laying the foundations of national digital transformation and building a digitally talented core team to lead the country's digital growth and development.

When one delves deeper into the policies for digital human capital development of Vietnam and Singapore, some commonality is evident. Like Singapore, Vietnam recognizes the vitality of digital transformation for nation-building. It is seen as key to creating a new growth engine to propel Vietnam to becoming a high-income country by the year 2045. Vietnam and Singapore share policies for developing digital skills and a core team of digital talent. However, Vietnam's policies differ in terms of focus and scope as well as implementation. In fact, the requirements for developing digital human capital resources are huge and challenging in terms of quantity and quality. At the same time, Vietnam's policies are limited both in scope and implementation mechanisms, and thus they are insufficient in realizing the ultimate growth of digital human capital resources. The country's workforce remains underprepared for the digital economy and nation-building.

On the one hand, it is about time for Vietnam to implement specific policies and programs to equip the population with the appropriate digital skills to adapt to digital transformation, while on the other hand, the country needs to implement breakthrough policies and important programs to develop a core team of digital talent able to lead the digital transformation process.

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