Singapore's Practices and Implications for Facilitating Digital Transformation in SMEs

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Abstract. The Singapore government began to launch a series of strategies to promote digital transformation in both the public and private sectors in the early 1980s. In 2017, it officially launched projects for small and medium-sized enterprises (SMEs)to move towards digitalization and other supporting projects, which played a good role in promoting the transformation of SMEs. The article introduces the main practices of Singapore in promoting the digital transformation of SMEs, as well as the challenges and corresponding methods encountered by Singapore in promoting the digital transformation of SMEs. It also introduces how the CTOaaS project helped a vendor achieve digital transformation as a case study. These practices of the Singaporean government have implications for China or local governments in China, which mainly include: policies must be continuous and up-to-date, policies should avoid complexity and be simple to operate, policies should consider differences, and emphasis should be placed on improving the digital skills of enterprise employees.

Keywords: SMEs; Digital Transformation; Digital Economy; Singapore

1 Introduction

Digital transformation is happening rapidly around the world, especially in the economic sector, where it can boost economic growth, create new jobs, improve efficiency and accelerate the development of small and medium-sized enterprises (SMEs). For enterprises, digital transformation refers to the adoption of digital technologies and information technology to make comprehensive and profound changes to business processes, organisational structures, products and services, etc., in order to achieve better profitability, improve efficiency and develop new business models and revenue streams.

COVID-19 has accelerated the digital transformation of businesses globally, breaking the traditional resistance to digitalisation in many non-technical businesses. Now, digitalisation is no longer an option, but a necessity for business survival[1] .

The Singapore Government has recognised the importance of digitalisation to the economy since the 1970s and 1980s. In Singapore, digital transformation is seen as a key factor in increasing productivity, boosting economic growth and ensuring the country's competitiveness in the global economy. So what measures has Singapore taken to promote digital

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transformation among SMEs? How effective are these measures? What are the lessons for local governments in China? These are the questions that this paper will explore.

2 The state of digital transformation in Singapore's SMEs

2.1 Overview of Singapore's digital economy

Singapore is a highly developed country, a country that covers an area of only 710 square kilometers and has a population of less than 6 million. According to the World Bank, Singapore's GDP per capita was $82,800 in 2022, ranking it eighth in the world. Eighty of the world's top 100 technology companies have a presence in Singapore. In the IMD World Digital Competitiveness Index 2020, Singapore is ranked second out of 63 countries, behind the United States.

According to the《Singapore Digital Economy Report 2023》(SGDE 2023) published by Singapore Infocomm Media Development Authority (IMDA)), the digital economy is defined in Singapore as consisting of two components: a)Value-added (VA) of the Information & Communications (I&C) sector; b) VA generated from digitalisation in the rest of the economy (i.e. excluding I&C sector).

In 2022,the overall nominal VA of the digital economy in Singapore amounted to S$106 billion (Equivalent to $77.5 billion), equivalent to 17.3% of Singapores nominal GDP, up from 13% of GDP in 2017. It has grown at a compound annual growth rate (CAGR) of about 12.9% p.a. since 2017. The I&C sector accounted for around one third of Singapores digital economy, with the remaining two thirds attributable to the VA from digitalisation in the rest of the economy.As a result, the value-add from digitalization as a share of the economy rose steadily from 8.7% in 2017 to 11.9% in 2022, the report said.

2.2 Definition of SMEs

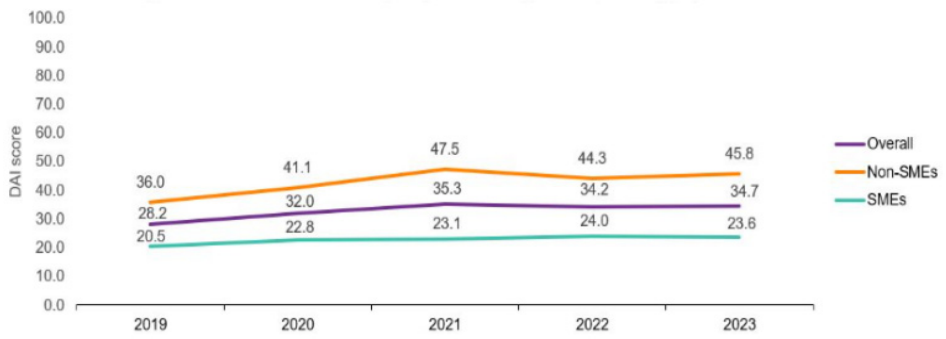
In Singapore, SMEs are defined as enterprises with operating revenue not more than $100mil or employment not more than 200 workers. In 2022, the number of businesses in Singapore is 299,800, with SMEs making up 99 per cent of the total. SMEs are at the heart of Singapore's economy, employing two thirds of Singapore's workforce and contributing to the country's economy. In 2022, the number of businesses in Singapore is 299,800, with SMEs making up 99 per cent of the total.

2.3.Status of Digital Transformation of SMEs in Singapore and Initial Achievements

In 2020, Association of Small & Medium Enterprises (ASME) ,Microsoft Singapore jointly surveyed 400 local SMEs in Singapore, which revealed that 80% of SMEs recognise the need for digital transformation and 83% have developed a digital transformation strategy. SMEs believe that the biggest benefits of undertaking digital transformation are cost savings and increased revenue.

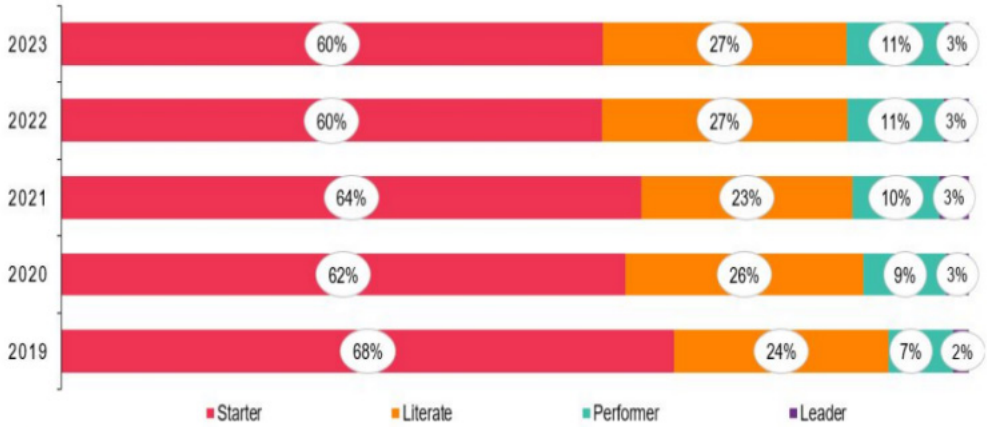
Since the implementation of Singapore's digital transformation strategy specifically for SMEs in 2017, there has been an overall trend of growth in digital adoption among Singapore's SMEs. As shown in Fig. 1, the Digital Acceleration Index (DAI) for Singapore SMEs has

increased from 20.5 in 2019 to 23.6 in 2023, but 60% of SMEs are at the beginning stages of digital maturity (Fig.2).



Base:DAI Study respondents from 23 ITM sectors
Source:IMDA Digital Acceleration Index (DAI) Study 2019-2023

Fig. 1. Digital Acceleration Index (DAI) Scores by Enterprise Type,2019-2023



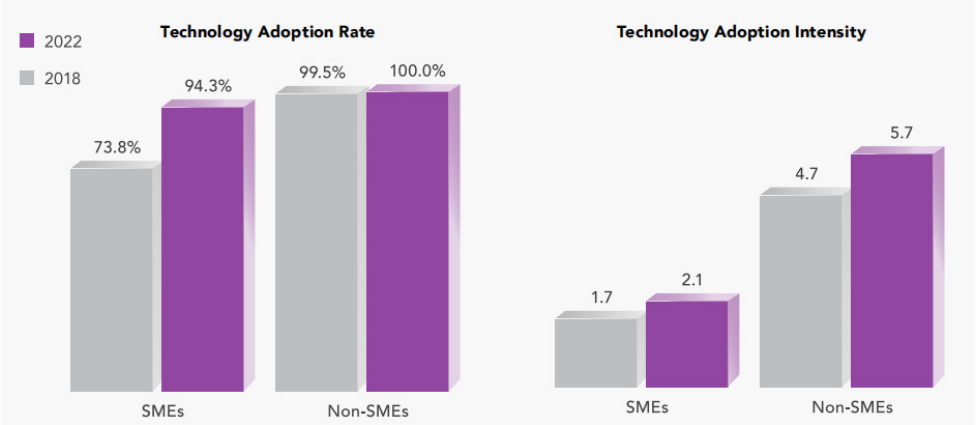
Base:DAI Study respondents from 23 ITM sectors
Note:percetages may not add up to 100% due to rounding.
Source:IMDA Digital Acceleration Index (DAI) Study 2019-2023

Fig. 2. Digital Maturity of SMEs, 2019-2023

In addition, while both SMEs and non-SMEs have increased their digitisation, especially SMEs, their technology adoption rate (the proportion of businesses adopting at least one digital technology) has increased from 73.8% in 2018 to 94.3% in 2022. However, there is still a significant gap between SMEs and large enterprises (non-SMEs) . For example, the technology adoption intensity (the average number of digital technologies adopted per firm) of SMEs increases to 2.1 in 2022, but this is significantly lower than that of non-SMEs, which is 5.7 (Fig. 3).

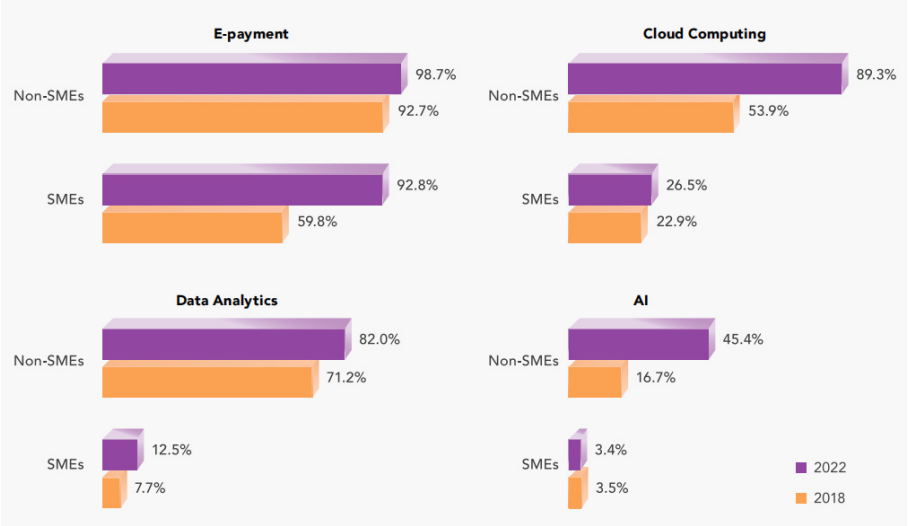
There are also differences in the adoption rates of different digital technologies between SMEs and non-SMEs in Singapore. In general, non-SMEs have higher adoption rates of technologies

such as cloud computing, data analytics and artificial intelligence, far more than SMEs. On the other hand, the extent to which SMEs have progressed in adopting digital technologies varies widely. For example, SMEs have made significant progress in adopting e-payments, rising from 59.8% in 2018 to 92.8 % in 2022, an increase of 40%. However, their level of adoption of other digital technologies (such as cloud computing, data analytics and AI) remains relatively low, with adoption of AI technologies instead falling to 3.4% in 2022 (Fig.4).



Source: IMDA

Fig. 3. Technology adoption rate and intensity by SMEs and non-SMEs, 2018-2022



Source: IMDA

Fig. 4. Adoption rates of selected technologies by SMEs and non-SMEs, 2018-2022

3 Singapore's approach to promoting digital transformation in SMEs

Given its small size and sparse population, Singapore recognised the importance of digitisation for economic development in the late 1970s.Singapore's digital transformation is largely driven by national public policies[2].In the early 1980s, it embarked on a national computer programme to promote digitisation in the public sector. Since then, a number of digitisation-related strategies have been developed and implemented, including the National Information Plan (1986-1991), IT2000 (1992-1999), Infocomm 21 (2000-2003), Connected Singapore (2003-2006) and Smart Nation (2006-2015). These strategies provide a good foundation for digitising Singapore's public sector and some key areas.

In 2014,Singapore set out its goal to become the world's first Smart Nation, and implemented the Smart Nation Strategy in 2018, in the same year Singapore launched The Digital Economy Framework For Action. In 2015, the Infocomm Media Plan 2025 was launched to complement the Digital Economy Framework For Action policy.

3.1 Key measures for digital transformation of SMEs

The Information Communication Media Development Authority (IMDA) is the government agency dedicated to the digitalisation of SMEs, IMDA works in partnership with other government agencies to promote and implement the digital transformation of SMEs. So far, IMDA has carried out the following major initiatives in promoting the digital transformation of SMEs.

3.1.1 Launch of the project "SMEs Going Digital"

In April 2017, IMDA launched the SMEs Go Digital project, which refers to supporting and nurturing SMEs to use digital technologies for digital transformation. As of March 2023, more than 90,000 SMEs have benefited from the project. Below are some of the key practices of the project.

(1)Chief Technology Officer-as-a-Service (CTOaaS)

IMDA has dedicated a one-stop web-based service platform, CTO as-a-Service, on its official website. SMEs wishing to embark on digital transformation but do not know how to do, by answering a few questions online,can assess their digital readiness and receive the digital solutions based on their business situation and needs, including funding available to them. SMEs can also access digital consultancy and project management services through the CTO as-a-Service shared pool of digital consultants, which are government-screened advisors who can provide personalised advice and services to businesses, free of charge for the first time. As of March 2023, more than 23,000 users have used CTOaaS to find digital resources that suit their needs, more than 900 businesses have engaged digital consultants, and 90% are satisfied with the digital consultancy services.

(2)Industry Digital PlansIndustry Digital Plans (IDPs)

IDPs are digital programmes launched for different industries, which are designed to help SMEs understand the digital skills, corresponding digital solutions and results required by

businesses at different stages of development. The programme maps out industry roadmaps in detail so that SMEs can have a clear idea of their route and goals for digital transformation.

Taking the ACCOUNTANCY INDUSTRY DIGITAL PLAN as an example, the plan first defines the accounting industry and accounting entity enterprises, then gives a roadmap for the digital transformation of the accounting industry, the roadmap simply and clearly depicts the guidelines for the digital solutions of the accounting industry in each stage and the corresponding effects, and finally the roadmap gives the relevant training that can be provided for specific positions in the accounting industry. Finally, the roadmap gives relevant training for specific positions in the accounting industry.

As of now, IMDA has launched digitisation programmes for 22 industries.

(3)Pre-approved solutions

IMDA offers more than 400 pre-approved digitisation solutions on its official website from reliable vendors that have been evaluated and market-proven to be cost-effective. Enterprises can get the appropriate digitisation solutions and offers by searching the official website for industry or solution keywords or operator name. SMEs interested in adopting these solutions can use CTOaaS and apply for funding.

(4)Advanced Digital Solutions (ADS)

ADS aims to help SMEs adopt advanced technologies (e.g. AI, robotics, blockchain and IoT, etc.) and integrated solutions (e.g. B2B solutions integrating inventory management, e-payments) to deepen their own capabilities, enhance business continuity, build long-lasting resilience, and solve common enterprise-level challenges at scale.

3.1.2 Digital Leaders Programme (DLP)

Launched jointly by IMDA and EnterpriseSG in August 2022, the programme is designed to support businesses that are already digital and ready to integrate digital technologies into their core strategic business.

The Digital Leaders Programme arms companies with digital knowledge and capabilities through a three-pronged approach - Empower, Enable, Engage - to develop organisations into digital leaders, able to use digital to stay ahead of the competition and drive the next round of growth. The Digital Leaders Programme arms companies with digital knowledge and capabilities through a three-pronged approach - Empower, Enable, Engage - grooming businesses into Digital Leaders equipped to leverage digitalisation to stay ahead of the competition and drive their next bound of growth.

Through the DLP, organisations can access support for the creation of a core digital team consisting of a leader and up to five digital talents, as well as access to relevant financial support for consultancy services required to develop a digital roadmap and for the development of new digital products and services.

3.1.3 Better Data Driven Business (BDDB)

The programme is being jointly launched in September 2021 by IMDA and the Personal Data Protection Commission ("PDPC"). By helping SMEs gain valuable consumer insights,

enhance their data analytics capabilities and grow their business through the responsible use of data. The programme provides SMEs with free training and free business intelligence tools to help SMEs protect their customers' personal data while effectively using data to improve their competitiveness in the digital economy.

3.1.4 SG Cyber Safe Program SG Cyber Safe Program

Launched in March 2021 by the Cyber Security Agency (CSA), the programme is designed to help businesses of all types to better protect themselves and enhance cybersecurity in the digital sphere.The CSA offers the Cybersecurity Toolkit on its website, which provides information on cybersecurity issues and threats to enable organisations to take cybersecurity measures that are relevant to their job roles. The CSA also offers a programme dedicated to developing cybersecurity wellness plans and financial support for eligible SMEs.

3.2 Other important supporting measures

3.2.1 Digital infrastructure construction

Digital infrastructure is the foundation on which the digital economy is built and the pedestal on which businesses carry out their digital transformation. Singapore has built a solid digital infrastructure. As of 2022, Singapore has 164% cell phone penetration, 95% 5G coverage, the world's fastest fixed broadband speeds, Asia's No. 1 ICT infrastructure, a top submarine cable integrator linking 25 active submarine cables, and 60% of the Asia-Pacific region's data centers located in Singapore.

On June 5, 2023, the Ministry of Communications and Information (MCI) released the Digital Connectivity Blueprint, a national strategy to guide the development of Singapore's digital infrastructure, which provides a holistic plan for Singapore's digital infrastructure, including hard infrastructure, physical digital infrastructure and soft infrastructure.

3.2.2 Digital skills education

Singapore also attaches great importance to the cultivation of digital talents. In addition to cultivating digital talents through the United University of Singapore, the Ministry of Education (MOE) launched the National Digital Literacy Program (NDLP) in March 2020 to cultivate the digital literacy of secondary school students, so as to enable students to master digital skills at different stages. In addition to hard digital skills, Singapore's digital skills education also emphasizes the development of soft skills such as critical thinking, problem solving and adaptive learning. It enables students to acquire the digital skills needed to navigate the digital age through the four components of the "Discover, Think, Apply and Create" framework.

3.2.3 International digital trade rule-making

By the end of 2023, Singapore is involved in the development of three major digital trade rules: DEPA, RCEP and CPTPP. in particular, DEPA, which was signed online on June 12, 2020 by three countries - Singapore, New Zealand, and Chile. the DEPA agreement aims to set forward-looking standards for the digital economy to support the digital economy and trade in the digital age. Unlike other digital trade rules, DEPA dedicates Chapter 10: SME Cooperation,

which has provisions on how contracting parties can help SMEs digitally transform themselves, establish overseas cooperation more efficiently, and access overseas markets.

A good digital infrastructure provides a solid foundation for the digital transformation of Singapore's SMEs, and it serves as a foundational safeguard for the digital transformation of SMEs. Digital skills education is a strategic investment. Incorporating digital literacy education into basic education and conducting universal digital literacy has accumulated human resources for the digital transformation of Singaporean SMEs. Participation in international digital trade rule-making opens the way for Singaporean companies to expand their digital standards and digital business overseas.

4 A case study of digital transformation of SMEs in Singapore

This section presents a concrete example of how CTOaaS in the "SMEs Going Digital" program has helped SMEs to achieve successful digital transformation.

Mr. Lee's family business started out as a vendor of snacks such as banana fritters. During COVID-19, Mr. Lee opened an online store to sell his snacks online. Mr. Lee's snacks were widely welcomed by Singaporeans at home and abroad, and he wanted to expand his business overseas. However, Mr. Lee was unable to take his snacks overseas as he lacked the necessary knowledge, experience and resources. While searching for a solution, Mr. Lee came across IMDA's CTOaaS. Through CTOaaS, Mr. Lee was put in touch with a digital consultant who took the time to thoroughly understand Mr. Lee's business needs for G20 Banana, ascertained their digital readiness, and came up with a digital solution that could improve their operations and reach. With the guidance of the digital consultant, Mr. Lee chose to implement an e-commence platform that would allow him to sell overseas while addressing pain points such as lack of physical presence, relevant knowledge and resources. Through the e-commence platform, Mr. Lee is expected to reach out to overseas buyers and supply chain partners and streamline the export, e-payment and listing processes.

5 Challenges and responses to the digital transformation of SMEs in Singapore

5.1. Challenges

Singapore faces both internal and external challenges in advancing the digital transformation of SMEs.

The first internal challenge manifests itself in the limited adoption of advanced digital technologies by SMEs[3]. Despite the combination of measures that Singapore has introduced to drive the digital transformation of SMEs, as can be seen in figure 4, the rate of technology adoption by SMEs in cloud computing, data analytics and artificial intelligence has progressed slowly and is much lower than the rate of adoption of advanced technologies by large enterprises.

The second internal challenge is the lack of specific digital skills among SME employees. A survey conducted by the Nanyang Technological University's Learning Center in 2020

revealed that while 94% of employers are using data more frequently than a year ago to make business decisions, 93% of corporate employers feel that their employees lack the necessary data skills.

The external challenge lies in the lack of internationally harmonized and widely accepted rules for digital governance.COVID-19 has accelerated the digital transformation of enterprises in various countries, but the corresponding international rules have not kept pace with the changes. For a country like Singapore, with its small size and small domestic market, the pace of overseas expansion of enterprises in the process of digital transformation is more restricted.

5.2 Response measures

Despite the Singapore Government's subsidies and various attentive services for SMEs' digital transformation, SMEs lack the costs, scenarios and skills to adopt advanced technologies. The Singapore Government is working on this, and one approach that can be seen is that Singapore is partnering with a number of international tech giants such as Microsoft, Google, Huawei and Alibaba, which can help SMEs to embrace and digitally transform themselves at a lower cost. For example, Huawei Cloud Singapore officially opened in 2019, and in 2022 Huawei Cloud Singapore carried out a program called Spark Program to integrate Southeast Asian SMEs on the cloud at a low cost and build an SME ecosystem.

In addressing external challenges, Singapore's approach has been to adopt an open attitude and actively develop and participate in international digital trade and economic rules, so that Singapore's standards are gradually internationalized. As mentioned earlier, Singapore has participated in three major digital trade rules.

6 Revelations

Like Singapore, SMEs are an important part of China's economy. By the end of 2021, the number of SMEs in China reached 48.42 million, of which more than 99 per cent were SMEs. Data from China's fourth economic census shows that the number of people employed by SMEs accounts for 80 per cent of the total number of people employed by all enterprises. The Chinese government attaches great importance to the development and digital transformation of SMEs. To this end, the General Office of China's Ministry of Industry and Information Technology (MIIT) issued a special Guide for the Digital Transformation of SMEs in November 2022, and various local governments are also taking active actions for the digital transformation of SMEs. So what are the lessons from Singapore's approach in promoting digital transformation of SMEs? This article will discuss this next.

6.1 Policies must be continuous and up-to-date

The digital development of enterprises is a long-term and continuous process that cannot be achieved overnight. Most SMEs lack the capital, technology, strength and long-term vision to digitise their business, and therefore need long-term support and assistance from policies. As can be seen from the above, Singapore has introduced a number of national policies to promote the development of the digital economy since the 1970s and 1980s, and after the official launch of the SME Digitisation Project in 2017, a number of supporting support

projects have been launched around the project, which complement each other to provide long-term and sustainable services for SMEs' digital transformation.

Policy continuity is not the same as not being able to make changes; policy continuity should be understood as a gradual process that should change as SMEs' digitisation needs change[4]. This is exemplified by Singapore's SME Going Digital project, where CMDA has increased relevant projects and funding grants in 5G and blockchain in recent years.

6.2 Policies should avoid complexity and are simple to operate

For many SME owners, they do not know why or how to go about digital transformation, and they have limited time to spend a lot of time understanding and carrying out digital transformation. As a result, overly complex policies make it difficult for SMEs to understand and even more difficult to engage them. In addition, multiple administrations also increase the complexity of policies, which increases the cost of time, choice and utilisation for SMEs.

A credible approach would be for one department to manage the project and launch a "one-stop shop" platform that avoids complexity, has simple, easy-to-use options, and explains the benefits of digital transformation in the right places, taking into account the type of business and the industry in which it operates.

In Singapore, the governing body for the implementation of the SME Digital Transformation Programme is IMDA. With the ability to search directly by entering keywords on the IMDA website, as well as filtering by type of support and industry, users are able to quickly and easily locate the services they need. IMDA offers more than 400 tested and approved proven digital solutions that can be directly recommended based on an organisation's digital readiness. Direct recommendations are made, which significantly reduces the cost of choice for SMEs.

6.3 Policies should take into account differences

Most SMEs do not have exactly the same digital needs, have different priority levels for different digital technology needs, and the same business has different needs at different stages of development, making the provision of differentiated services a key focus of digital transformation.

Before providing differentiated and personalised guidance to a business, a self-assessment of its digital readiness should be required[5]. As mentioned earlier, such an assessment should be simple and easy to follow. In addition, the self-assessment should be integrated with the industry, where digitisation needs vary greatly from industry to industry.

The Singapore government has done a relatively good job of providing differentiated guidance to SMEs. Firms can carry out self-assessments on the IMDA website, while Singapore has introduced IDPs for 22 industries (and counting) that are aligned with their respective Industry Transformation Maps (ITMs).Singapore's systematic, comprehensive, phased and differentiated approach to the transformation of traditional industries is worth learning from.

6.4.Focus on upgrading the digital skills of the company's employees

Lack of knowledge and skills required for digital transformation is a major problem for SMEs in the process of digital transformation, which makes it difficult for them to realize the potential of digital tools. Therefore, it is particularly important to enhance the digital skills of

business owners and relevant employees. This will not only solve the cognitive dilemmas of businesses in the process of digital transformation, but also address the problems they encounter in the process of digitalization practices, and help their personnel acquire the competencies needed for digital transformation.

When helping business people to upgrade their digital skills, the government should give companies a clear idea of the digital knowledge and courses required at different stages of digitization, as well as letting them know the digital knowledge and skills required for different positions. The training format should preferably be a combination of online and offline.

In response to the upgrading of digital skills of business personnel, the Singapore Government has been working in the following ways: first, launching the Digital Leadership Programme (DLP) to establish a core digital team to formulate and implement digital strategies; and second, identifying the digital skills that each industry needs at different stages in the industry digitalization programme projects, and offering corresponding training courses for these skills. Third, launching a national digital literacy program to incorporate digital literacy education into basic education.

7 Conclusions

In this paper, we analyze in detail the main practices of Singapore in promoting the digital transformation of SMEs, and we find that Singapore has a specialized agency responsible for promoting the digital transformation of SMEs, and in addition to launching targeted programs ("SMEs Going Digital"), they also take into account the needs of different industries, as well as the needs of enterprises at different stages of digital development and cybersecurity. Singapore has set an example in terms of digital literacy and training of employees in digital skills, and it is worthwhile for other countries and governments to learn from it in terms of systematization, continuity, differentiation of policies to promote the digital transformation of SMEs and the simplicity of the "one-stop service platform" it provides.

The research in this paper provides experiences and practices for countries and governments that want to promote the digital transformation of SMEs to learn from. In the future, we will focus our questions on the difficulties encountered by Southeast Asian countries, such as Singapore, in promoting the digital transformation of SMEs, and identify and analyze problems from the perspectives of both governments and enterprises, so that we can better serve the digital transformation of SMEs.

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