The research object focuses on the digital transformation (DX) process of the enterprises and corresponding management policies from the State. In the context of a transition economy, deeply integrated into the world economy, and facing competition pressure many times higher than the one in the domestic market, businesses have themselves prepared such things like the understanding of how DX is, how DX-ready they are, how much to invest and where they are on the path. The context of Vietnam is used as a good example of a developing country with progressing digitalization and fierce competition from abroad. Hence, the authors have carried out a positivist analysis, using quantitative and qualitative indicators to clarify the DX of the companie. Quantitative indicators refer to a 5-point scale or percentage point in the assessment, allowing the statements, by the survey participants or the researchers themselves, to have a uniform basis. Qualitative indicators are drawn from structured observations, in-depth interviews, and literature review, mainly focusing on two extremes, good and bad. As the main results of the study, almost 90 % of Vietnamese businesses raise awareness of DX to apply into their operations or to seek for DX solutions. Only 40 % of businesses have the budget to receive DX consulting and solutions, and up to 20 % of businesses have absolutely no budget for DX. The DX readiness is highest in industries whose activities are closely related to a direct supply of goods and services. The DX promotion may root from the increasing number of customers using the Internet alongside their savvy digital skills, or from digital logistics enabling the strong growth of e-commerce, and from favorable policies from the State. Still, concerns about personal data, costs of technology investment, or business habits changing are typical challenges

Keywords: digital, digitalization, digital transformation, DX, digital literacy, digital competence, digital readiness, digital maturity, digital foundation, e-Commerce, e-Government

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DIGITAL TRANSFORMATION OF BUSINESS COMMUNITY IN GLOBALIZATION: AN EMPIRICAL STUDY IN A TYPICAL DEVELOPING COUNTRY

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1. Introduction

DX plays an important role for businesses to be able to compete and survive successfully in both domestic and international market. Through the application of digital technology, businesses can optimize production and management processes, improve customer access, and improve competitiveness, creating new business opportunities and potential revenue growth [1]. Over the past years, the demand for DX has increased significantly among enterprises in all over the world, and so did the DX readiness of these organizations, especially in the high time of Covid-19.

As an example, the percentage of enterprises using e-invoices reached 100 %; the rate of enterprises using e-contracts reached 50 %; the percentage of small and medium enterprises using digital platforms reached 30.07 % in Vietnam [2]. In most operational areas, Vietnam's enterprises are in the middle of the "developing" stage and are increasingly approaching the "advanced" level of DX, which means they have begun to develop plans for the digitization although implementation of digitization is still fragmented while many processes have not been automated. Recognizing the importance of DX, Vietnam is one of the early countries in the world to develop a national DX program. Decision No. 749/QD-TTg of the Prime Minister of Vietnam approving the "National Digital Transformation Program to 2025, with orientation towards 2030" was officially issued on June 3, 2020. This decision emphasizes the vision that by 2030, the country will become a digital, stable and prosperous country and will emerge as a pioneer in testing new model technologies. The goal is also to improve the operations of organizations and everyday standard of living through a safe, humane and widespread digital environment [3].

Despite these encouraging results, the DX process still has its limitations in all over the developing world. Most Vietnam's enterprises still lack the budget for DX and are mainly in the digitization stage, or are gradually transitioning to using new technologies and software, not yet entering the fully completed transformation stage, "advanced" or "leading". This is more notable while Fitch Solutions' economic openness index has been gauged for the case of Vietnam, measuring two indices (trade openness and investment openness), based on the value of imports and exports and foreign direct investment as a percentage of GDP. Vietnam has scored 89.2 points in terms of trade openness, ranking 2nd in East & Southeast Asia and 5th globally, being attractive as a destination for investors looking elsewhere from China [4]. This reality of the economy pushes the Vietnamese business community to find ways to enhance their competitiveness.

However, the road ahead is still murky in terms of opportunities and challenges that the business community must, respectively, seize and overcome.

The perspective of a typical developing economy like Vietnam shows us the pictures of similar countries in economic development across the continents of Asia, Eastern Europe, Africa, and South America. It is also possible to see the analysis of the real situation of the country with the stories of more than 800,000 enterprises (an adequately large sample size) in a typical competitive context of globalization with high openness to the world. It is an important job not only for Vietnamese context, but also for a lot of lessons within the development process and DX progress of many other emerging economies around the globe.

Therefore, studies which are specifically devoted to the global communities of businesses can be of great scientific relevance as an empirical set of results regarding the DX, digital literacy, digital competence, digital readiness, digital maturity, digital foundation, e-Commerce, and e-Government policies.

2. Literature review and problem statement

The importance of DX is confirmed by the disruptive changes it brings not only at the enterprise level but also in the environmental, cultural, social and institutional aspects. This is why in the past decade, research on DX has been being paid more and more attention.

In [5], DX has been defined as the use of information and communication technology, not when trivial automation is performed, but in the case where fundamentally new capabilities are created in business, public government, and in the lives of people and society. However, the goal of the study is to clarify digital literacy and the literacies that make it up or that related to it, not DX. Although DX is considered as the ultimate stage of digital literacy after digital competence and digital usage are mastered, according to the author, it is not a necessary condition of digital literacy. As a result, the author also does not attach too much importance to a sequential path at each stage towards digital literacy. In other words, the concept of DX has only been mentioned but not deeply analyzed in this paper. The most significant about DX claimed is that DX is achieved when the digital usages which have been developed enable innovation and creativity and stimulate significant change within the professional or knowledge domain. This change could happen at the individual level or at that of the group or organization.

Within [6], there is a focus on DX at governmental perspectives. Coping a study time in the COVID-19 pandemic, the authors explore that the pandemic has not only increased technological literacies but caused changes of different organizational aspects such as employees' attitudes toward technology and organizational culture toward innovation. In particular, organizations heavily affected by the pandemic have benefited from a greater degree of digital transformation. Therefore, the study also affirms that DX does not only involve the implementation of digital technology but refers to changes in both the technical and social systems. Yet, ten case studies of organizations conducted by the authors are in the Austrian federal administration, which makes their findings are narrowly useful for illuminating changes in Austrian organizational aspects. Furthermore, although the pandemic has impacted DX, no advanced level of DX can be observed. This may be explained by the time required to reorganize existing processes, procedures, structures, and services and finally move toward an advanced level of transformation. Beyond that, digital government encompasses changes in the technical system and in the social system, whilst both systems were constrained during the time of the pandemic.

Investigating specifically DX in enterprises, the article [7] clarifies that DX is the great transformation of business and managerial activities, methods, skills, and models to completely leverage the modifications and possibilities of a blend of digital technologies as well as their hastening impact throughout society in the strategic and arranged way, with the current and future shifts into consideration. Beside delivering the idea of DX, the author indicates its key attributes, including a hyper-attention to the customer experience; well-defined, efficient, and more transparent operational processes; transparent integration between data and process; and focus on value rather than activities. Consequently, DX is a process that slowly brings organizations through different stages of technological innovations and enables them to become quicker and more aggressive in the present market. Though, due to the research aim and objectives not well defined, along with the ambition to analyze all the DX relevant definitions, features, viewpoints, dimensions as well as model, the article does not show the connection between the issues presented and the reasons why the issue was chosen for the explanation. As a result, the paper becomes a lack-of-direction synthesis.

In [8], the authors summarize different perspectives on DX in businesses into two aspects: digital resources and digital technology applications. Digital resources refer to abundant data resources generated by production and markets, which will assist firms in forming strategies, controlling the production process, and developing new products. Digital technology applications refer to software packages and systems used by almost every industry for various purposes, including communication, office productivity, research, data security, analytics, to help organizations optimize their operations. The paper also suggests the heterogeneity of DX while citing conflicting views and theories on the benefits of DX for enterprises' performance. On that basis, the authors survey, empirically analyze and conclude that DX can significantly increase total factor productivity but decrease firm performance by increasing the operational cost rate, reducing total asset turnover, and increasing management expenses. Despite of robustness tests, because the data used is limited in A-share listed Chinese enterprises from 2013 to 2020, these results are not necessarily accurate for different countries and for the present time.

As regards impacts of DX on enterprises, the study [9] emphasizes that the DX endows the enterprises with new development momentum. In essence, it is to improve the allocation of enterprise resources and reduce the impact of external uncertainty on the enterprise through the efficient flow of data. In addition to the transformation of production model, the DX also requires enterprises to break the old management model, establish a new organizational structure and operating system. The paper particularly examines the impact of DX on financial distress and find that DX can significantly alleviate financial distress mainly by reducing the operational risk and easing the financing constraints. Besides, higher economic policy uncertainty will promote the role of enterprises' DX to alleviate financial distress. The

conclusion is helpful to understand the driving effect of DX on high-quality development of enterprises and evaluate the implementation effect of DX in enterprises. Though, because the authors build the function describing the relationship only between enterprises' DX and their financial distress, this evaluation only base on the financial aspect.

The study [10] more comprehensively determines influences of DX on enterprise operations through transforming customer experience, operational processes, business models and improving digital capabilities of companies. However, this shape of DX is built through exploring and investigating large companies around the world with typically $1 billion or more in annual sales, while ignoring small and medium enterprises (SMEs). The paper [11] specifically identifies DX's impacts on enterprises, which include:

1. DX changes the ecosystem of the business. By finding new business models and services, businesses can reach out to new partners and suppliers via new channels.

2. DX allows increased experience and engagement through changes in the way businesses connect with customers, partners, employees and other members of the business ecosystem.

3. DX strengthens business ambition and enthusiasm by applying advanced operating methods, business processes and technologies towards business goals.

4. DX helps protect and enhance business value by reducing business risks as well as supporting smart strategy development.

5. DX changes corporate culture and leadership capacity. The business recognizes new strategic thinking that aligns with new ways of working, and seeks leaders who can think, act and react differently in the digital landscape.

6. DX affects brand building by focusing on the strength of the brand to enhance and expand the brand.

7. DX changes the way labor is organized. Enterprises aim to build human resources with open skills and connection.

8. DX affects the operations of the business in the process of identifying and quantifying market transformation opportunities.

9. DX helps businesses manage data, platforms and customers through digitization and system management.

Like the [10], the [11] also presents the problem from the perspective of a large enterprise, namely Deloitte. Although large traditional firms are truly different from digital entrants and their experiences in managing and benefiting from DX are extremely precious, they are sometimes not suitable for SMEs.

Based on its wide scope, DX is a continuous complex undertaking that can substantially shape a company and its operations. It is therefore important to ensure adequate and clear responsibilities for the definition and implementation of a DX strategy. This statement is presented in [12], where it is argued that to ensure the successful rollout of a DX strategy and fully exploit its intended effects, it is essential to closely align the four different dimensions, including use of technologies, changes in value creation, structural changes, and financial aspects. The dependencies between these different dimensions create a part of the DX framework, which supports firms in the assessment of a firm's current abilities and the formulation of a DX strategy.

Related to the DX framework, the research [13] explores another aspect on the factors affecting the DX process and foundations for DX of enterprises. DX is carried out by a combination of people, businesses, and technology and is led by a sound strategy, all affected by the national digital environment since all entities co-exist within the nation's sphere of influence. In terms of DX foundations, the author reveals that it is the foundations of DX, which involve internet connection, digital skills, digital payment, logistics, and policies and regulations on DX that help create the digital environment which plays a critical role in shaping not only the future DX of industries but also the DX strategies of enterprises. The study also uses the digital environment of Vietnam as a case study for researching on foundations of DX.

In Vietnam, DX in entrepreneurial community has been ignited since 2018, and reached a big step forward in 2020 when the Prime Minister of Vietnam approved the national DX program. Researches on DX in Vietnam have therefore been mainly published in recent years, many of which are carried out by state agencies or national development projects. According to [14], DX in Vietnam is understood as the process of comprehensive change of individuals and organizations in the way of living, working and production methods based on digital technology. In other words, DX is the transformation of operating models based on digital technology and digital data. Current major technology trends include: mobile Internet, cloud computing, big data, artificial intelligence, financial technology, Internet of things, advanced robotics and additive manufacturing. Since this document systematizes DX-related issues as a kind of manual, it only addresses theoretical basis and how to perform DX rather than an analysis of the current situation of DX.

The paper [15] also emphasizes that DX activities in Vietnam can range from digitizing business and management data of enterprises, applying digital technology to automate and optimize business processes in management, reporting, workflow, products and services to transform the business model, creating new value for the business. It concludes some DX trends in the world and in Vietnam, indicates DX roadmap for Vietnam's small and medium enterprises, and proposes a number of technology solutions according to the DX roadmap. Although this study has surveyed the position of Vietnamese enterprises in the DX roadmap, it has not detailed the speed of DX in each industry or specific operations. The research also describes the DX readiness assessment tool of small and medium enterprises. However, due to this is a new continuous online survey tool exploited at the portal of the agency conducting the survey (http://digital.business.gov.vn/dangkydn), the survey results had not been compiled at the time of publication of the study.

In [16], the researchers examine the digital maturity of Asia-Pacific small and medium businesses through four dimensions: digital strategy and organization, digital processes and governance, digital technology, and digital people and skills. In accordance with the study, as of 2020, Vietnam is one of Asia-Pacific countries being in the digital indifferent stage. At this stage, businesses only focus on business results and have no or just started implementing digitalization activities; most processes are still manual, fragmented investments, with no cloud application and only use office spreadsheets, and lack of digital skills. However, since this is a research result for the entire Asia-Pacific region, the indicators related to Vietnam are only limited at the classification by digital maturity level and ranking by criteria, including Technology Investment, Digitalization Challenge, Digitalization Priorities, but not specifically analyzed.

The article [17] focuses on analyzing history, concept, and nature of "digital society", "society 5.0" as a basis to

propose an overall model of a digital society suitable to the reality of Vietnam from the overall "digital society" model of some countries in the Asia-Pacific region and "society 5.0". This model evolves four specific pillars: digital economy, digital government, digital culture, and digital society for Vietnamese practice and implications for countries at the same level of development. However, they are more like the fields of DX than the pillars, and the reason to define these 4 pillars is not really convincing because it is purely based on the concept of "society", which is "all fields and activities in social life, especially in the economic, political, cultural, and social fields". In addition, as this study only focuses on a model proposal, the authors ignore the current situation of digital transformation in Vietnam.

The papers [18] and [19] are reports announcing survey results in 2021 and 2022 on Vietnamese enterprises' DX. Thereby, a number of data on the current situation have been published such as: purposes of approaching DX, the application of digital technology in business operations, the enterprises' need on DX supports, the readiness for DX. However, not being beyond the characteristics of an annual report, these documents only focus on presenting the survey results without detailed analysis to clearly identify opportunities and challenges in the future DX process of Vietnamese enterprises.

In a glimpse of DX in specific sectors and industries of Vietnam, some of the studies are listed below: [20] indicates factors affecting the DX in logistics enterprises and proposes solutions to promote this operation in Vietnam's logistics enterprises; [21] aims to pinpoint the motivations for online retailing adoption and business performance among Vietnamese businesses in the formative DX stage within an extended technology-organization-environment framework; [22] shows the data of an investigation on the factors affecting the readiness of Vietnamese students for DX in the context of digital changes in Vietnam's education and the Covid-19 pandemic; [23] argues that there is an emergent digital culture in the art and cultural sector in Hanoi, which is producing a paradigm shift in the nature of work for cultural professionals, the way of preserving and displaying art collections as well as the nature of international connections. In general, these studies only go into the analysis of the DX situation in each specific industry because the research scopes have been specifically defined by the authors.

It can be seen that, with the popularity and recognized importance of DX, this topic is increasingly interested and there are many researches on it. These researches have presented various concepts of DX, but all have admitted DX is about applying technology to rapidly change traditional processes, products and services into data-driven and highly connected solutions that can be monetized through extreme efficiency gains and entirely new business models. Therefore, DX is not simply digitization, but initiates a comprehensive change. The specific impacts of DX, the factors affecting DX, as well as the foundations and framework for DX have also been analyzed in detail. However, these works are mainly aimed at large-scale enterprises, instead of SMEs. Narrowing the research scope into DX in Vietnam, the works have also clarified the standpoint on DX of Vietnam, the digital maturity of Vietnam's enterprises and analyzed the current situation of DX in some sectors of the country. However, one of the important shortcomings that previously published scientific works have not been able to do is to comprehensively systematize the current situation of DX in Vietnamese enterprises, and assess this DX process with challenges and opportunities for Vietnamese enterprises in an integration context. Moreover, the level of investment for DX can be of great concerns while how much is enough for enterprises, especially when more than 90 % of them are SMEs. As society's readiness for digitalization increases, so does businesses' readiness because the need of a business consumer is a derived demand. Therefore, it is also clearly to see the significance of analyzing the relationship between that DX readiness and the investment levels of enterprises, in order to better shape the position of businesses in different industries on their DX path alongside the roadmap of the entire country.

In conclusion, the literature gap to be filled in the research is the formation of necessary analysis and assessments related to DX awareness, DX investment and readiness, DX roadmap position of Vietnamese enterprises to identify advantages and disadvantages for them at the present time. This is a special period of time when the whole world is restarting with new supply chains, beginning to take shape after the Covid-19 pandemic. This time, the national economy will again have the opportunity to deeply connect with the regional and global economy. Hence, competitive pressure has increased in the harsh globalization, especially for open and developing economies like Vietnam. Therefore, the assessment of DX for businesses and the economy is vital.

3. The aim and objectives of the study

The major aim of this study is to clarify the importance of digital awareness and digital readiness for the business community in developing countries, through a typical country's example. From there, countries and business communities can get a clearer picture of how much investment they can spend on DX in their economies and enterprises. The results of that investment process need to be well measured to show the position that countries and businesses have achieved on the entire process of digitizing their economy in a strategic approach.

To achieve this aim, the following objectives are accomplished:

– to analyze the demand for raising awareness of DX in enterprises;

– to determine the position of enterprises in the DX roadmap

– to explore the digital readiness of enterprises;

– to examine the level of investment on DX in the business community;

– to assess the advantages of enterprises in DX process;

– to assess the disadvantages of enterprises in DX process.

4. Materials and methods

The object of the research includes the DX process in enterprises, the DX-related policies of the State. The scope of the study is differentiated by the case of Vietnam with more than 800,000 active enterprises to provide a typical example of the situation of countries with similar developing conditions on all continents.

The main research hypotheses put forward are:

– H1: DX awareness has a positive effect on DX investment;

– H2: DX readiness has a positive impact on DX investment;

– H3: DX awareness is positively correlated with DX readiness;

– H4: DX investment has a positive impact on the position of the business on the DX roadmap.

The assumptions in the study are made with the situations of countries around the world:

1. The Government's DX policies have a positive impact on the progress of the DX process in the business community.

2. DX increases the competency of enterprises in the context of globalization and fierce competition.

Based on the simplification of DX-related content, the authors approach the DX process of enterprises in the selected country, concentrating on topics that are easily accessible and understandable to the interviewees. To conduct research on DX for businesses, the authors have used the following research methods.

Data collection method. The research team has collected secondary quantitative data from statistical reports, highly reliable domestic and foreign scientific documents on enterprises' DX activities, focusing within the scope of Vietnam and the period from 2017 to 2023. Quantitative indicators in the study involve:

– survey data on demand, status of implementation and investment for digital transformation of Vietnam's enterprises: The surveys were conducted by the Department of Enterprise Development, Vietnam's Ministry of Planning and Investment, in collaboration with USAID through the LinkSME Project in 2021 and 2022, with the numbers of Vietnamese enterprises participating in the surveys being 1,300 and 1000 respectively. These enterprises come from various sectors and are mostly micro, small and medium sized enterprises (under 200 employees), accounting for over 70 % in the 2021 survey and over 80 % in the 2022 survey. The report has been a result of collecting primary data in large volume through survey and in-depth interviews with stakeholders, in which 3 main target groups (educational sector, entrepreneurs, governmental offices) were classified for field research, to be carried out in parallel. To the authors, this group of people has been reinvestigated by asking the ones who have not been in the previous survey of the Department's study. They include at least 1-hour structured interviews with each among 10 SMEs' businessmen and 10 governmental staff to avoid being theoretical in the approach to the DX problems. This can be treated as the second test of the previous data, and also the chance for the recorrections if any;

– reported data on digital foundations in Vietnam related to internet connection, digital skills, digital payment, logistics: These quantitative indicators are published by prestigious organizations and enterprises specializing in statistics and having high rank in the fields of digital technology.

In terms of qualitative data, the authors use descriptive data that can be observed and interpreted (in the combination with quantitative indicators) to determine and explain the advantages and disadvantages of Vietnam's enterprises in DX process.

Statistical and comparative methods. Based on the collected data, the team conducts descriptive statistics, compares survey data, and reports results to analyze the current situation of DX among Vietnamese businesses.

Analytical synthesizing methods. From reports and references on DX, the team uses data synthesizing methods to have the most comprehensive and objective view of the research topic to include both the advantages and disadvantages of DX in Vietnam's enterprises.

5. Results of enterprises' DX empirical analyses for the exemplary economy

5. 1. Demand for raising awareness of DX

A full awareness of DX is a prerequisite for businesses to build a vision for their change. In Vietnam, the businesses approach DX knowledge with different purposes (Fig. 1). In 1,300 enterprises participating in the 2021 survey, up to 39.5 % of businesses want to raise awareness about DX in order to apply DX knowledge to their businesses. It can be assumed that these businesses have a decent awareness of the need for DX and its benefits. This is a premise for businesses to initially implement DX to improve production and business efficiency.

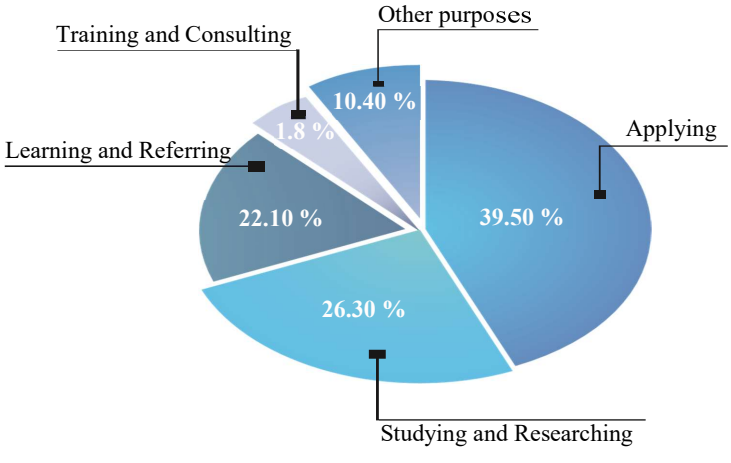

Fig. 1. Purposes of approaching DX knowledge of Vietnam's enterprises
Source: [18]

The next two most common purposes of businesses when accessing DX knowledge are for Studying and Researching (26.3 %) and Learning and Referring (22.1 %). This result shows that these businesses are in the process of learning to implement DX. On the other hand, less than 2 % have the purpose of using DX knowledge for internal training or consulting for third parties in need. Businesses with this need are mainly those that provide training and consulting services on DX for other businesses. This rate remains at a very low level because to be able to conduct training or consulting on DX, these businesses must have high levels of technology and high-quality human resources to perform such tasks as well as having an in depth understanding about technology solutions and existing suppliers in the market. The remaining 10.4 % approach DX knowledge for other goals.

Generally, the awareness of Vietnamese businesses about DX is gradually increasing in recent years. Businesses realize that DX is a necessity to enhance competitiveness by optimizing business processes. The application of digital technology in management and operations will help reduce costs, increase efficiency, improve productivity and service quality, and strengthen the position of enterprises in the new era of globalization. In addition, businesses are well aware that DX is not only a task of the information technology de-

partment but also a task of the whole organization and that it requires the commitment of business leaders and employees in its implementation.

5. 2. Position in the DX roadmap

Despite of the well spread awareness, DX has not yet reached the expected targets. Enterprises are mainly in the digitization step, or have gradually used new technologies and software but have not achieved the set goals, so they have stopped the implementation, or are still implementing with difficulties and inconvenience. Fig. 2 has shown the corresponding positions of the Vietnam's enterprises.

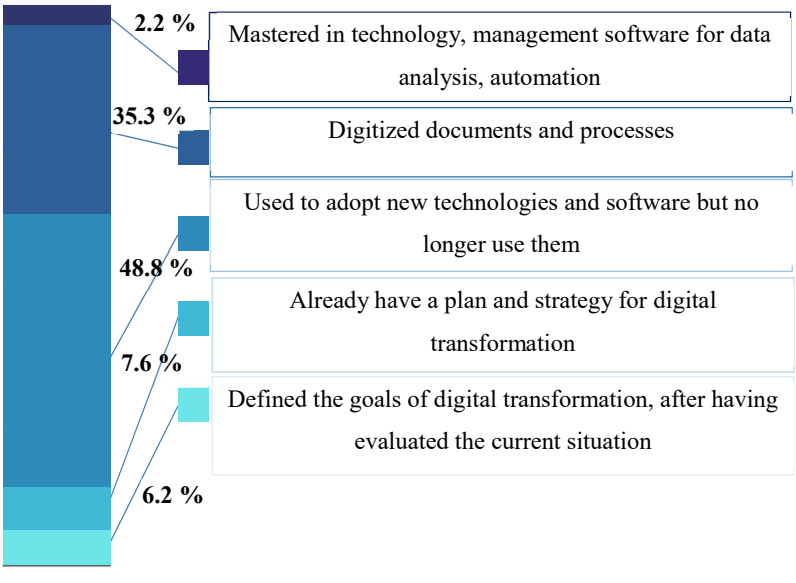

Fig. 2. Position of Vietnam's enterprises in the DX roadmap
Source: [15]

Among 1300 Vietnamese businesses participating in the 2021 survey, 48,8 % have used some DX solution but are no longer using it because the solution is not suitable, or businesses apply it to meet immediate needs in the presence of Covid-19 epidemic, but such need is no longer relevant. Another explanation is that businesses have not identified the right DX goals and strategies; or they lack the human resources for DX in both quantity and quality. This is evident when only 6.2 % have completed defining DX goals and only 7.6 % have gradually developed short and long-term plans for DX.

35.3 % of Vietnam's enterprises have digitized data and processes, which help them to move towards DX on a broader and more synchronous scale. A small percentage (2.2 %) have mastered technology, management software for data analysis, automation to make decisions in production and business.

5. 3. DX readiness of the enterprises

When developing a tool evaluating DX readiness, Vietnam's Ministry of Planning and Investment, in collaboration with USAID, has developed an assessment framework that allows businesses participating in the survey to recognize their digital maturity in seven areas and operations, including Strategic orientations, People and Organization, Customer experiences and Multichannel selling, Financial management, accounting, planning, legal and human resources, Supply chain, IT system and Data management, and Risk management and Cybersecurity.

Based on business feedback, the answers for each area and operation are converted to a scale of 1 to 5 *point*s corresponding to the levels of digital maturity from Basic to Leading as shown in the Fig. 3

Fig. 3. Levels of digital readiness of Vietnam's enterprises
Source: [15]

Readiness by areas and operations in the enterprises.

Vietnam's enterprises have a relatively developed level of digital readiness, especially in strategic orientation of enterprises, reaching the highest "advanced level". In Fig. 4, it has been seen that Strategic orientation (3.1 points); People and Organization (2.9 points); and Multichannel selling (2.9 points) are three aspects with the best level of readiness. This indicates that the human resources team – from management to employees – is maturing in their ability to grasp and be aware of DX trends. In addition, enterprises have also made strides in applying digital technologies to measure, capture, and quickly adjust policies to meet customer needs, serving customers with differentiated services and personalization.

For management operations, most Vietnam's enterprises have applied digital technology to their accounting operations at a high and normal level. However, financial management, planning, human resource management realms still have a modest level of DX. Therefore, the average readiness level of all aspects of financial management, accounting, planning, legal and human resources is above average (2.8 points).

Readiness for DX in Supply Chain (2.7 points) and Information Technology & Data Management System (2.6 points) are similar. Digital technology has been applied more commonly in a number of operations such as inventory management, production lines, and purchasing management. Many businesses have digitized data and standardized processes to move towards DX on a larger scale and more synchronously.

Meanwhile, Risk Management and Cybersecurity (2.4 points) is a significant concern of small and medium enterprises in the process of DX. Enterprises have difficulties in grasping the risks associated with implementing DX (including strategic risks, risks from outside and inside the business). The lack of a process to check and review vulnerabilities in the DX system is a common limitation of Vietnamese businesses.

Readiness by industry. Fig. 5 shows that the industries with a high level of readiness are all whose activities are closely related to producing and transporting goods and services directly to customers, such as: agriculture and forestry, aquatic products; manufacturing and processing; wholesale

and retail, repair of motor vehicles; accommodation and catering services or construction.

Assessing the readiness of Vietnam's enterprises for DX by industry, 12/16 industries have an above-average level (2.5 points). That is, most of the surveyed industries have been developing digitization goals in strategic planning and have established the necessary management positions or separate DX projects. This is a positive signal that businesses in most industries are ready for this breakthrough and comprehensive shift. Meanwhile, enterprises in the industries of arts and entertainment, administrative activities and support services, real estate, and education and training (below 2.5 points) are only building digitization goals and not ready for a specific strategy.

5. 4. Enterprises' investment on DX

In Vietnam, approximately 40 % of 1,300 businesses in the survey have the budget to meet the needs of DX from medium to full, in order to receive DX consulting and solutions (Fig. 6). Meanwhile, up to 43.3 % of businesses have an investment budget for DX, but not enough to meet actual needs, while up to 20 % of businesses have no investment budget for DX [19].

In fact, the lack of budget for DX is a common challenge for Vietnamese businesses, especially small and medium enterprises. Enterprises need support at almost all stages of DX, from the initial foundation stage of the process, such as standardizing business processes and building a DX roadmap, to the next stage of implementing or receiving technology solutions for DX.

Fig. 4. DX readiness in 7 dimensions of Vietnam's enterprises
Source: [19]

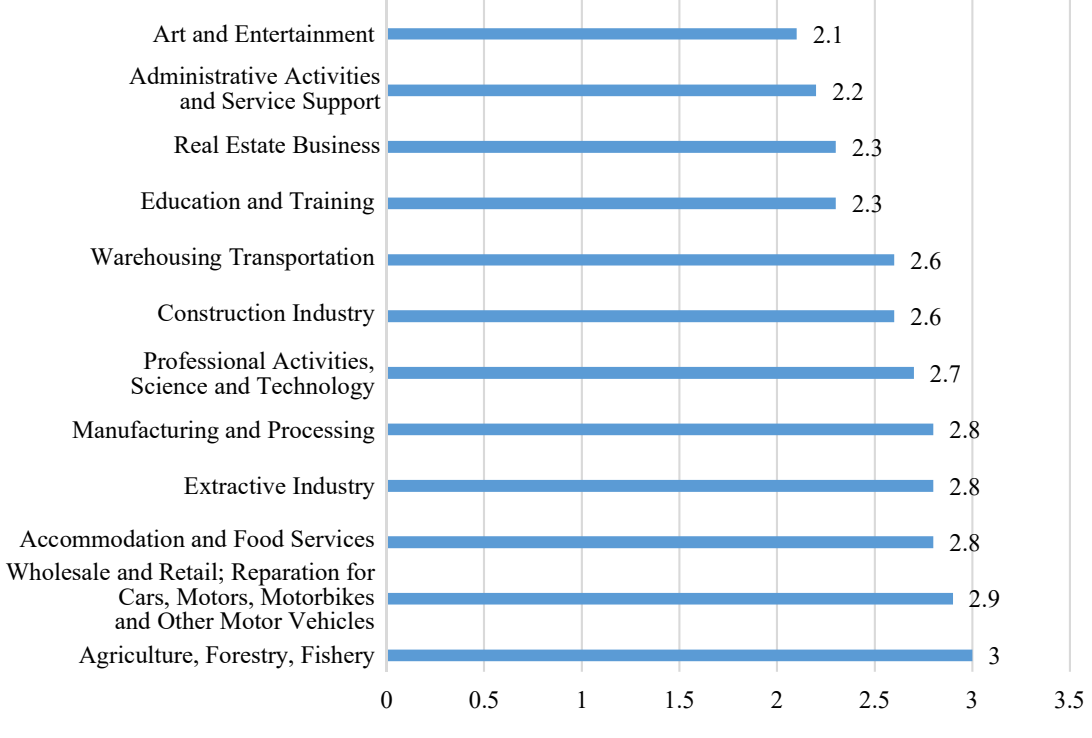

Fig. 5. Vietnam enterprises' readiness for DX by industry
Source: [19]

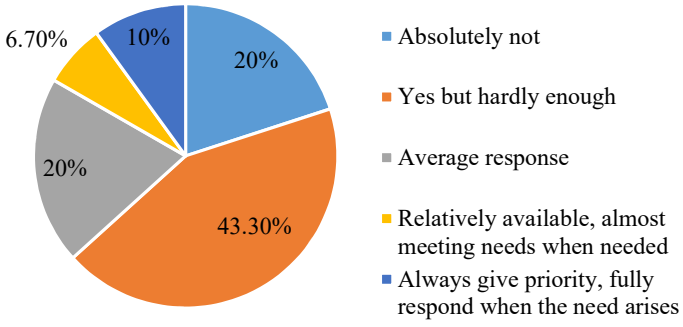

Fig. 6. Investment budget for DX of Vietnam's enterprises
Source: [18]

5. 5. The advantages of enterprises in DX process

5. 5. 1. The increase in number of Internet users

The number of Internet users in Vietnam has reached to 77.93 million in January 2023, which is equivalent to an Internet usage rate of 79.1 % of the total population and has increased by 5.3 million (+7.3 %) compared to 2022. Besides, the number of social network users in Vietnam has also increased tremendously with 70 million users, equivalent to 71 % of the total population. The total number of active mobile connections is 161.6 million, equivalent to 164.0 % of the total population (We Are Social, 2023).

According to the latest report of SpeedTest, the average mobile internet speed in Vietnam increased by 8 places, ranked 43/138 over countries. The fixed network increased one place to 45/179 as of January 2023. The widespread development of the Internet and social networks as well as the rapid improvement of the quality of Internet access has enabled quick connections between businesses, government, and customers, accelerating DX faster than ever.

5. 5. 2. The improvement in Vietnamese people's digital skills

Although the Internet has been widely popularized in Vietnam, the effectiveness of using it towards the goal of DX depends on users' digital skills. According to The Global Talent Competitiveness Index 2022, Vietnam's digital skills only ranked 82/133 countries [24]. On a more positive note, this ranking is trending up. Compared to 2020, Vietnam has increased 14 places in terms of digital skills. This shows Vietnam's remarkable efforts in promoting digital literacy. On January 28, 2022, the Prime Minister of Vietnam issued Decision No. 146/QD-TTg approving the project "Enhancing awareness, universalizing skills and developing human resources for DX in the country to the future till 2025, with a vision of 2030." Soon after, in April 2022, the Ministry of Information and Communications of Vietnam launched an online learning platform at onetouch.mic.gov.vn. This program aims to popularize and improve digital skills for the nationwide public regardless of their personal differences.

5. 5. 3. Breakthroughs in e-commerce and digital payment in Vietnam

Vietnam has a fast-growing e-commerce market and has one of the highest rates of smartphone and Internet usage worldwide. This is the foundation for the rapid growth on many digital fronts, including digital payments in Vietnam. There were 57.6 million digital commerce users in Vietnam in 2022 (Fig. 7). By 2027, Statista Digital Market Outlook estimates that the number of users in this segment will potentially reach 79.3 million. From being one of the most cash-dependent countries in Asia, the acceptance rate of cashless payments in Vietnam has increased to 95 %/year during the COVID-19 pandemic, one of the highest rates in Southeast Asia [26].

Instead of cash, mobile wallets, cards and QR codes have become alternative payment methods for many Vietnamese today. In 2022, the transaction value in Vietnam's digital commerce segment reached 18.06 billion USD, the 4th highest in Southeast Asia, surpassing Singapore and Malaysia. Also, Statista Digital Market Outlook estimates the transaction value in this segment to reach $35.5 billion by 2027 [26]. Remarkably, Vietnam recently has outranked other developed countries, including the UK, Germany and the United States, in terms of penetration rate of mobile POS payments, fueled by the ubiquity of mobile phones. Statista Digital Market Outlook estimates that the number of POS mobile payment users in Vietnam will increase from 30 million in 2022 to about 35 million in 2027 [25].

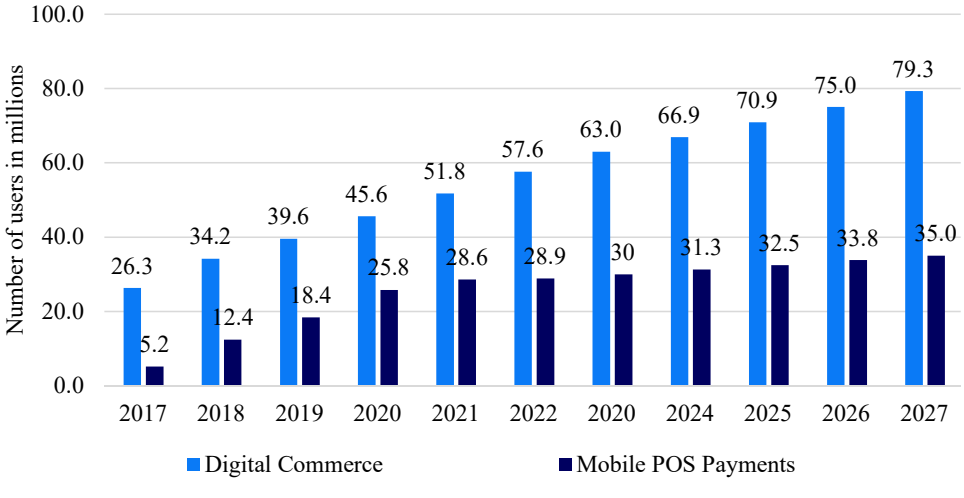

Fig. 7. Number of digital payment users in Vietnam from 2017 to 2027
Source: [25]

DX in payments has been taking place across the entire financial services sector in Vietnam, from banks and telecommunications companies to financial groups. However, it is the Vietnamese startups that have been at the forefront of changing the way people pay in the country. These include popular payment applications in Vietnam such as MoMo e-wallet – leading in e-wallets, or VNPay of VNLife – leading in QR Code payment sub-segment. In Vietnam, digital payments is the fintech category with the most startups and funding. As a result, Vietnam has witnessed the emergence of many new payment services every year. These startups, along with the

innovative solutions they create, are expected to strongly support the DX process in Vietnam. It can be seen that finance is not only a field that has undergone significant changes thanks to the digitalization process, but also has become a driving force for the digital economy in Vietnam.

5. 5. 4. DX enhancement through logistics service quality improvement

Like in finance, the logistics sector has also been being greatly affected by DX, while it is also one of the industries promoting the spread of the digital economy. Most importantly, the increasing efficiency of the logistics industry also means an improvement in the digital commerce supply chain [26].

The Vietnamese logistics market is ranked 10th in the group of 50 global emerging logistics markets [27]. Vietnam's freight and logistics market is expected have a compound annual growth rate (CAGR) of 5.5 % from 2023 to 2028 [28]. Many logistics businesses in Vietnam are converting from traditional to digital. The Vietnamese government also identifies logistics as one of eight industries that need to be prioritized for DX (PM of Vietnam, 2020). One of the tasks to improve competitiveness and develop Vietnam's logistics services by 2025 as per Decision No. 221/QD-TTg dated February 22, 2021 of the Prime Minister of Vietnam is "Research on research, application, technology transfer and technical progress, promoting DX in logistics services" [29].

5. 5. 5. Prompt promulgation and implementation of policies, regulations and programs, supporting DX

Since the promulgation of the "Law on Electronic Transactions" in 2005, Vietnam has issued around 20 legal documents, by-laws, master plans and initiatives to facilitate national DX. 2020 is considered a pivotal year when the Prime Minister of Vietnam announced the National Digital Transformation Strategy, kicking off a period of extensive and comprehensive national DX. In particular, promoting the development of digital technology enterprises in Vietnam is a priority. From studying models of developed economies on digital technology enterprises, the Government of Vietnam determined that by 2030, Vietnam needs at least 100,000 digital technology enterprises to facilitate digital economy development, smart city, smart nation and cyber security [30].

The Vietnamese government also has numerous supports for businesses in the DX process, in which the Program of Digital Government (the more advanced version of e-Government) with the goal of creating a modern and convenient e-government system has been well received. As a result, people and businesses can access online public services conveniently and quickly. In 2021, Vietnam also officially issued Decision No. 12/QD-BKHDT on the Support Program for Enterprises in Digital Transformation for the 2021–2025 period.

5. 6. The disadvantages of enterprises in DX process

5. 6. 1. Barriers on investment costs, technology application

Enterprises believe that the cost of investing in digital technology solutions and the cost of deploying and maintaining technology is relatively high compared to other costs that businesses are incurring. While the efficiency of technology application may be high, the technological impact in production and business activities is not evident in the short term.

Up to 60.1 % of Vietnam's enterprises participating in the survey said that the barriers they face when applying digital technology are because the investment and technology application costs are high. This is partly due to the impact of the Covid-19 pandemic, which has caused businesses to face many challenges in terms of revenue reduction, capital and personnel shortage, which affect the financial commitment to investment and implement solutions for DX.

5. 6. 2. Difficulty in changing business habits

Difficulty in changing business habits and practices is considered the second biggest barrier that causes difficulties for Vietnam's enterprises, accounting for 52.3 % of surveyed enterprises. DX requires changing business habits and practices. This factor is considered long-term, difficult to implement, and highly dependent on the head of the business. In addition, some businesses have rolled out the technology initiative, but employees do not apply to the fullest potential, therefore making the DX goals of enterprises not achieved.

5. 6. 3. Lack of internal human resources to adopt digital technology

Another difficulty of Vietnam's enterprises is the lack of workforce with expertise in digital technology, accounting for 52.3 % of the surveyed enterprises. This makes DX less likely to be successful. Although the awareness of DX of Vietnamese businesses has improved over time, while many businesses have had the intention and the need for DX and have started to work towards DX goals, they still face many challenges, including shortage of staff with experience, knowledge and skills to implement DX initiatives. Recruiting and retaining digital experts is also a big challenge, especially for small and medium enterprises. Part of the reason for this is the competition in wages and working conditions among businesses, as well as the lack of education and specialized training in the information and communication technology sector in Vietnam.

5. 6. 4. Lack of digital technology infrastructure

Digital technology infrastructure is considered one of the most important factors when businesses perform DX. However, the consequences of high investment costs lead to a lack of necessary infrastructure for businesses to effectively and comprehensively implement DX. 45.4 % of Vietnam's enterprises surveyed reflect that the lack of digital infrastructure is a major barrier.

Specifically, businesses are finding it difficult to adopt new technology solutions such as cloud computing, artificial intelligence, blockchain, and IoT because they do not have the necessary infrastructure and skills to implement them.

Some businesses have the ability to invest in their own digital infrastructure, but most SMEs cannot afford that investment. This leads to a big difference between enterprises in terms of competitiveness in the market, as some enterprises can use advanced technologies to optimize production and business management, while others businesses have to compete with less advanced production methods.

5. 6. 5. Lack of information about digital technology

Digital solutions and technologies are diverse, rich and constantly updated according to the needs of the market. Failure to capture information about existing solutions and

technologies and their suitability to businesses can make it difficult for businesses to initially apply technology to their business activities. Moreover, the lack of information and knowledge also affects the interaction and cooperation between businesses with each other and with foreign partners in the DX process.

5. 6. 6. Difficulty in integrating digital technology solutions

Integrating digital technology solutions for businesses is a complex process and requires synchronization and efficiency between solutions. The consequences of using management software to serve production and business activities sporadically and without proper planning pose challenges for businesses to integrate current new technology solutions. In addition, one of the difficulties in integration is the difference in systems and processes between different technology platforms. This requires a large investment of time and costs to coordinate between systems, which are a significant barrier for businesses while implementing DX.

5. 6. 7. Lack of commitment and understanding of Board of Management

Effective DX requires the commitment of leaders from the executives to middle management. This is one of the important factors to avoid the DX being unfinished or underinvested. About 32.1 % of Vietnamese enterprises participating in the survey face this difficulty in their DX process. Once business managers are not fully aware of the importance as well as how to implement DX, they will not invest time, effort and resources in conducting digital solutions.

5. 6. 8. Lack of commitment and understanding of employees

Lack of commitment and understanding of employees is also one of the important challenges in implementing DX at enterprises. Some of the major difficulties include the following:

– lack of training and capacity building for employees in digital technology. The implementation of digital technology solutions requires employees with specialized knowledge, skills and competencies to apply. However, many Vietnam's enterprises have not yet fully invested in training and capacity building for employees in this aspect, leading to a lack of understanding and low applicability;

– employees' subjectivity. Some employees have existing working habits and do not see the need to be adaptive and use digital technology in their work. This leads to a delay in the implementation of DX and reduced work efficiency;

– fear and difficulty in adapting to new technology. Digital technology is constantly changing, so employees may find it difficult to adapt to new technologies. They may feel afraid to use new software or new technology, especially when they do not have enough knowledge to use them.

5. 6. 9. Concerns about personal and business data leakage

Fig. 8 has, then, illustrated the relative levels of difficulties that each type of barriers has laid onto the Vietnam's enterprises in their DX.

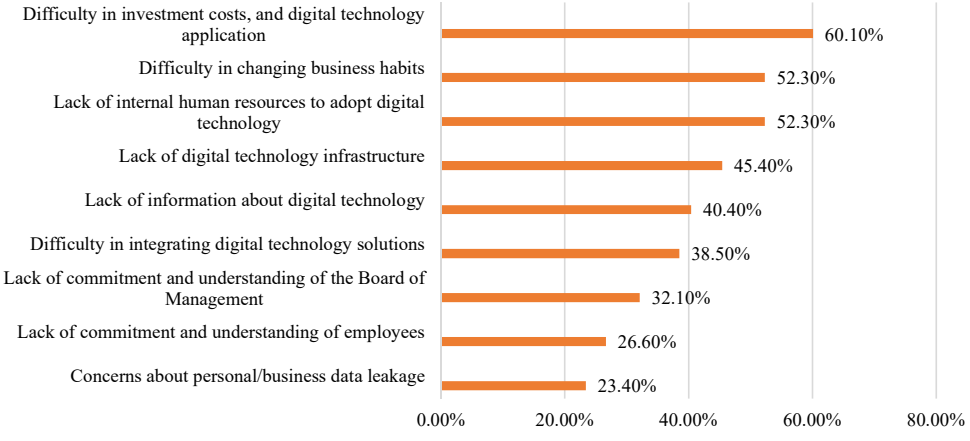

Fig. 8. Barriers and difficulties of Vietnam's enterprises in DX
Source: [2]

Leaking personal and business data is one of the most serious problems in the DX era. Business database is considered a valuable asset and if leaked, it can have tremendous consequences for all involved parties. Causes of data leaks can be due to employees not following security protocols, using software, devices with security holes, attacks from hackers or wrongdoing by third parties. Although the challenge of cybersecurity is considered a serious problem for only 23.4 % of businesses surveyed (the lowest rate of the 9 most basic barriers), concerns about information security when using technology solutions should prevent these businesses from stepping out of the safety limit to change. On the other hands, it may raise a suspicion that because Vietnamese enterprises have not yet reached the final stages of the DX process, they have not really realized the seriousness of this risk.

6. Discussion of enterprises' DX within a globalized and competitive context

Research results in Fig. 1 show that there are many reasons for Vietnam's enterprises to approach the DX process. In particular, the goal of DX for application is still the main one, followed by research and development, learning to improve qualifications and skills, and training versus business consulting. In a globalized context with so many competitive pressures, the values that businesses are pursuing become more short-term than being strategic, in order to put things into practice and gain investment effectiveness right away.

Fig. 2, on the other hand, adds a very clear perspective on the reality of DX in Vietnam's enterprises. The results show that enterprises applying the top layer of DX such as big data analysis and artificial intelligence account for only a very small percentage (about 2.2 %). Most other businesses are still confused in investing in DX, or have policies that have not really been implemented, or even have deployed but not used the system efficiently. According to Fig. 3, the level of readiness for DX of Vietnam's enterprises is at a low level (Basic), or at positive changes (Developing) rather than achieving high-ranking levels such as Developed, Ad-

vanced or Leading. This is, again, a great pressure for the competitive efficiency of production and business activities of the enterprises.

In that context, Fig. 4 shows that the highest scores for DX readiness in Vietnam's enterprises lie in the array of strategic orientations, personnel and organizational management, as well as customer relationship management. A contradiction is found when the DX strategic directions are taken care of, but the actual actions of enterprises do not comply with it (Fig. 1). Fig. 4 also reveals a low level of readiness for the DX process to analyze and manage technology risks and ensure digital security in enterprises. Fig. 5, in addition, has signaled a good sign that the agriculture, fishery and forestry sectors have the highest readiness (even more than retail, accommodation and food services). This positive sign may come from the State's preferential policies for these key economic sectors in Vietnam in order to create economic restructuring to move the country towards the directions of a sustainable economic growth, modernity and industrialization.

However, the level of budget for DX investment in enterprises is undeniably a decisive factor for effective implementation. Fig. 6 shows that businesses have not actively allocated resources for DX. Most businesses say that they are not financially qualified to implement DX (more than 60 %). Certainly, these businesses will not change their opinion to seek outside sponsored resources for the DX process if the small number of businesses (about 10 %) which have been ready to invest relevant budget for DX at any time comes up without a successful completion of the process.

As consumers become more and more friendly with the environment of digital transactions, digital payments and e-commerce, Fig. 7 has confirmed the prospects of the economy with an increasing number of Internet users. Therefore, businesses cannot delay the comprehensive DX process because of immediate difficulties such as investment costs or the fear of changing consumption habits in the community. The answer to the necessity of investing in and implementing DX may not come immediately in this study because of its limitations and drawbacks. In the future, there needs a thorough assessment on the interrelationships between DX policy, DX awareness, DX readiness, DX investment, and actual effectiveness of DX. The DX of Vietnam's enterprises also needs to be measured with quantitative researches, investigative studies with primary survey data, in a highly representative sample group and at a larger scale.

When being asked about things such as awareness of the importance of DX, and the position of Vietnamese enterprises in the DX journey, the level of readiness for DX, or investment in DX in in-depth interviews, SMEs' representatives shared some notable differences with what we have obtained from studying the secondary data. The major problems (as the conflicts found) can be noted as follows:

– the SMEs often do not have enough budget for long-term investment in DX. Moreover, for individuals and/or SMEs, paying a deposit in advance for the entire DX process at the enterprise level is not a very wise thing to do. According to the interviewee's ideas shared when under the pressure of technological innovation, countries have begun to pay more attention to its economic development within a new context of competition. Thus, 70 % of businessmen and 90 % of government officials have mentioned the term of DX strategy, emphasizing that the strategy has been already in their management thinking;

– referring to the position of Vietnamese enterprises on the DX roadmap, only 20 % of entrepreneurs think that Vietnamese enterprises have well-grasped the world's leading technologies to go ahead and catch up with the global waves of competition with the intensive use of digital technology; 80 % of state officials believe that Vietnamese enterprises have been already in a good position in the global DX when policies are starting to prosper. Therefore, it is possible to see a contradiction in this perspective when public managers are more optimistic than the business community;

– for DX readiness, 100 % of respondents assured that they are ready. But while only 10 % are borrowing money from banks to invest in that DX process, the remaining (90 %) are only available in principle when they know that the resources are not enough to cover their DX goals anyhow. Despite the fact that 70 % of the officials think they understand the internal readiness of the businesses, the miracle has not yet come. Necessary resources for DX are still in the hands of big players in the market. They have enough and the situation is quite unbalanced;

– about the assessment of the enterprise's DX investment, it is remarkable that both groups of interviewees said that what happened in reality have not aligned with the conclusion, in which agriculture, fishery and forestry are the areas with the highest readiness for DX. In fact, the service sectors such as banking, retail, and media are the ones that show great changes in DX. The customer experience of those areas has increased noticeably for the interviewees in their daily errands. For 100 % of respondents, readiness has to be proved with the actual level of investment and implementation;

– the overall assessment of 80 % of businessmen and 100 % of government officials shows that DX in a national administration will create a sense of great impetus for the DX in the business community. That would be likened to a train that needs a captain to lead all along the way. However, the practical difficulty of the implementation process is the funding and DX strategy. For the state management side, the necessary capital can be created in some way to support the business, but that only happens with two important conditions:

1) the enterprise has to take steps with clear strategy and ambitions to go global in the digital trading space;

2) a strong political will on the part of the authorities.

In short, the research methods cannot help us confirm the correctness of the hypothesis H1 when it is not certain that the understanding of DX will vary in the same direction as the actual investment level of the enterprises on it. Similar to H3, it cannot be asserted that a deeper awareness of DX will lead to a higher willingness to implement it in the business, especially when that high awareness is accompanied by a sense of risk-fear from the leadership. However, the hypotheses, H2 and H4, are accepted as a high readiness level will result in a large investment, and the larger the investment, the higher the prospect of going further on the DX route.

Therefore, the policy and corporate management implications that should be the most effective solutions to be implemented in the present time towards the entrepreneurial community are:

1) for the legislative and executive agencies in the realm of DX, the policies promulgated and implemented must address the support of the business community to overcome digital obstacles such as accessing to credit for investment in new technologies, training world-class human resources in digital technology applications, or taking regular measures to engage the business community in digital opportunities

with globally advanced technologies. At the same time, the assurance of safety and security in cyberspace for business data sources of organizations and enterprises and personal data sources of users in digital systems should be of great concern. These policies, hence, connect the business community, suppliers and consumers, and especially create a firm belief in the DX process in the whole economy;

2) for the business community, the biggest difficulty of most enterprises while implementing new technologies is the failure to align the benefits of DX with their business goals. Convincing each department in the enterprise to accept the change of habits and pattern of cooperation is not an easy process for technology managers. Therefore, this explains why the DX process in enterprises can take place quite early but develop at a slow pace. It is mainly because many business leaders are too cautious and risk-averse. However, most business leaders are aware that DX is not merely technology-oriented, but in fact the transformation must commence with the business model and leadership mindset. If they are persistent and determined enough to implement DX, businesses will be able to change technology and transform from traditional models to a smarter, greener and more sustainable production and business model.

The biggest limitation of the study is that it has not been able to approach many typical countries in the continents for DX issues in terms of the business community and policy actions of the Governments. When that can be done for developing countries with high economic openness, which are facing the harsh competition of globalization, the research results should be more reliable. With a larger sample size, with its diversity, quantitative analyses can be used more to examine many aspects of the problems. The second weakness of the study is that the primary survey data has not been collected as directed by an unsimplified theoretical model. When this is done, the results of the investigation and assessment will be carried out in many dimensions, giving the conclusions more weight. Along with that, two major disadvantages to the research process are the lack of researchers with stronger quantitative tools, and the budget for expanding the scope of the study. If these limitations can be overcome together, tackling the disadvantages, turning them into advantages, then this topic will be more and more interesting.

7. Conclusions

1. The awareness of DX for Vietnamese businesses is at a positive level when more than 65 % think that applying new technologies in DX and using them for research and development activities are their major choices.

2. Only a very small part of the business community has mastered digital technology and has an in-depth DX strategy. Meanwhile, the remaining 95 % are either in the early stages of DX or are confused with the implementation of the DX strategy.

3. DX readiness in the Vietnamese business community is, surprisingly, starting to be stronger in the agriculture, forestry and fishery sectors than in other industries (reaching 3 points). Enterprises also showed their highly strategic status in DX application (3.1 points).

4. DX requires a large financial and investment resources. This becomes an obstacle for more than 60 % of businesses, especially the small and medium enterprises. The number of enterprises with available financial resources to invest in DX accounts for a low proportion (about 16.7 %).

5. Advantages for the DX process in the Vietnamese business community come from the increase in the number of Internet users and digital platforms, the advancement in users' digital skills, the development of e-commerce and digital payment, the improvement of logistics service quality, and the fact that supporting policies have been issued and implemented in time by the State.

6. The difficulties for the DX process in the Vietnamese business community lie in barriers of investment costs and technology application, barriers from business habits, barriers from the shortage of digital human resources, and barriers from the lack of digital technology infrastructure, barriers from the lack of information, barriers from the lack of integrated technology solutions, barriers from the lack of commitment and understanding of BOM, barriers from the lack of commitment and understanding of employees, and privacy barriers in possible personal and organizational data leakage.

Conflict of interest

The authors declare that we have no conflict of interest in relation to this research, whether financial, personal, authorship or otherwise, that could affect the research and its results presented in this paper.

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Data availability

Data will be made available on reasonable request.

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