The Current State and Role of Digital Technology Adoption in Tourism MSMEs in Cambodia

The Asia Foundation

CDRI Cambodia Development Resource Institute

THE CURRENT STATE AND ROLE OF DIGITAL TECHNOLOGY ADOPTION IN MICRO, SMALL AND MEDIUM-SIZED ENTERPRISES (MSME) WITHIN THE CAMBODIAN TOURISM SECTOR

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Acknowledgement

Table of Contents

List of Figures

List of Tables

Abbreviations and Acronyms

4IR	Fourth industrial revolution
ADT	Advanced Digital Technology
AI	Artificial Intelligence
BDT	Basic Digital Technology
CDRI	Cambodia Development Resource Institute
DT	Digital Technology
ICT	Information communication technology
IDT	Intermediate Digital Technology
IoT	Internet of Things
LDC	Least developed countries
MSME	Micro, small and medium enterprise
OLS	Ordinary least square
RGC	Royal Government of Cambodia
SME	Small and medium enterprise

Executive Summary

The majority of businesses in Cambodia are micro, small, and medium-sized enterprises (MSMEs), which account for 99.9 percent of all businesses and a sizable portion of employment in the private sector. The adoption of digital technology (DT) among Cambodian MSMEs is still uneven and relatively low, despite the fact that it has become an essential component of successful business operations. This study looks at the adoption of digital technology among MSMEs in Cambodia's tourism industry and empirically evaluates how it associates with firm performance. A survey of 1,000 MSMEs in the tourism industry was conducted in seven provinces: Phnom Penh, Siem Reap, Preah Sihanouk, Kampot, Mondulkiri, Ratanakiri, and Koh Kong. The analysis uses firm-level data from this survey.

Key findings:

- This report finds the COVID-19 pandemic has had a significant impact on MSMEs within Cambodia's tourism sector, with 72 percent reporting significant revenue declines. As a result, some MSMEs (31.9 percent) temporarily suspended operations, several (20.22 percent) laid off employees, and others decreased production and service supplies. Additionally, approximately half of MSMEs reported investing in new technologies or digital solutions in response to COVID-19.

- Despite the availability of government assistance, 49.12 percent of MSMEs reportedly did not receive any financial support, while 23.03 percent and 21.09 percent reported to have received tax and rent deferrals, respectively. Micro enterprises are even more disadvantaged as 70 percent of them received no government assistance at all. Access to low-interest loans and assistance with skill development have been made available, but few micro enterprises have been able to obtain these subsidies.

- The results also suggests that 60 percent of MSMEs are digitised at the basic level, 30 percent are at the intermediate level, and 10 percent are at the advanced level. Using social media, primarily Facebook, Telegram, and Instagram, for sales and marketing, as well as e-payment methods, is more prevalent than using a website and sophisticated tools for back-end operations.

- MSMEs' adoption of digital technology is impeded by numerous obstacles. Specifically, 58 percent of MSMEs cite a lack of digital skills as the primary barrier, while 28 percent cite a lack of budget. In contrast, 32 percent of respondents have doubts about the return on digital investments, fearing they won't be able to recoup their initial investment due to weak business cases. Enterprises with a lower degree of digital adoption are more uncertain about digitalizing, suggesting that they are hesitant to initiate or expand their digitalisation when they are in the early stages of digitalisation.

- For 40 percent of MSMEs surveyed are unfamiliar with digital technology, while 35 percent have a limited understanding of this term. Regarding the perceived benefits of digital technology, 43 percent of MSMEs believe that digitalisation can help them provide better customer service, 34 percent report an increase in their customer reach, and 29

percent claim that it provides them with access to better marketing tools. Given the benefits, the vast majority of MSMEs intend to increase digitalisation in the near future.

- This report also empirically assesses the role of DT in firm performance, and it finds that MSMEs' productivity and revenue are positively correlated with investments in digital technology. To be more precise, a 10 percent increase in DT investment would lead to a 0.8 percentage point increase in revenue. For MSMEs that train staff and use the internet for service sales and marketing, productivity and revenue increases are greater. Compared to other sectors, MSMEs in the hospitality sector gain the most from DT investment.

- This report also provides evidence that digital engagement is positively associated with firm productivity. When DT adoption is broken down by stage, only MSMEs in the intermediate stage benefit from digital adoption. This suggests that in order to increase productivity, it is necessary to uptake digital technology adoption, which includes having a website, using social media and networks more frequently, being more active on digital platforms, and adopting e-payment methods. MSMEs with DT implementation in the intermediate stage have a productivity level 16 percentage points greater than MSMEs with DT adoption in the basic stage. Only MSMEs who train their personnel benefit from the use of DT in terms of revenue.

- Additionally, this study shows that businesses with intermediate levels of digitalisation were more resistant to the COVID-19 shock than businesses with low levels of digitalisation. The research demonstrates how crucial digital transformation is to reducing the COVID-19 pandemic's detrimental effects. The potential advantages primarily rely not only on the accessibility and use of technological tools and essential software, but also— and maybe more importantly—on a stronger propensity for using websites, social media, digital platforms, and e-payment systems.

Policy priorities:

MSMEs in Cambodia's tourism industry are already embracing digital technologies, but the majority of them are just employing basic DT, which prevents them from reaping the full benefits of digital transformation. It is crucial for Cambodia to encourage MSMEs to go digital since digital technologies are essential to business performance and success. The following six main areas should be the focus of policies to improve MSMEs' digitalisation:

a) Promote ICT and other digital infrastructure

Improved ICT and other digital infrastructures are necessary for digital transformation. Accelerating the construction of high-speed broadband infrastructure is necessary in order to close the digital divide. A few examples of policy responses in this direction are bolstering and increasing investment in digital and telecommunications infrastructure; promoting universal access to high-speed, high-quality internet at an affordable price; and enhancing penetration and adoption of broadband connections outside of urban areas.

b) Increase knowledge and skills on digitalisation

MSMEs require digital skills to succeed in an era when the economy is becoming more digitalised. Furthering the development of the workforce's digital competencies and assisting

them in unlocking greater digital engagement are essential given that MSMEs lack skilled personnel and access to specialised expertise in digital technology, and also that skills and training are essential to firm performance. Since the demand for training in digital skills is highest among micro, women-owned, and unregistered businesses, training in digital skills should target these businesses specifically. Introducing science, technology, and entrepreneurship into primary and secondary school curricula; assisting MSMEs in developing their workforces' digital skills; and offering digital expertise and guidance - particularly with regard to the process of digitalisation and how to more effectively use digital tools - are examples of policy measures to upskill MSMEs' workforce.

c) Promote digital literacy

The majority of MSMEs, according to this survey, have little to no knowledge of digital technology, which highlights the need to encourage digital literacy, especially among company decision-makers. In this direction, policy measures include stepping up initiatives to raise awareness of the advantages of digital technology and assisting MSMEs in creating a digital investment strategy. Micro and unregistered businesses are the most likely to lack knowledge of digital technology and its advantages, so policies to promote digital literacy should focus more on these business types.

d) Support access to financial services

Our findings demonstrate the necessity of facilitating MSMEs' access to business loans and expanding mobile money and electronic payment options. Credit guarantees, expanding the operation of SME Bank with a focus on improving MSMEs' access to finance, and promoting the acceptance and usage of digital payments with the goal of facilitating enterprise operations should all be the focus of policies. It is critical that digital payment instruments are accessible, affordable, effective, and reliable, and inclusive digital payment systems must be built accordingly.

e) Enhance trust in digital solutions

The foundation for the growth of the digital and e-commerce ecosystem is the establishment of trust and confidence in the digital system to safeguard customers. This is supported by a solid legislative framework, in particular by laws pertaining to data protection and privacy, cybercrime, and e-commerce use ethics, as well as by management practises for cybersecurity. The government should continue creating pertinent laws, rules, and a national cybersecurity plan, as well as institutionalising oversight mechanisms at both the national and sub-national levels. It is crucial to educate MSMEs' managers and owners about cybersecurity issues and to offer them training in these areas. Cambodia can also take advantage of regional fora by cooperating with other regional parties to help MSMEs overcome barriers to using e-commerce and to advance global cooperation on cybersecurity and protection from cybercrime.

f) Incentivize MSMEs to uptake digital technology adoption

MSMEs need incentives to uptake digital technology. To encourage MSMEs to adopt digitisation in their company operations, Cambodia may consider expanding the existing "SME Go Digital" program beyond information sharing and digital literacy and capacity building.

Giving a matching grant for the purchase of digital services could be one way to incentivize DT adoption. Another sort of assistance is the professional guidance that providers of digital solutions, significant industry partners, and business groups offer to MSMEs on a variety of efficient digital solutions. Similar to other policy priorities, digital technology adoption support should target micro and unregistered businesses.

1. INTRODUCTION

1.1. Background

Digital technologies are all electronic tools, automatic systems, technological devices and resources that generate, process or store information. Frontier technologies like the internet of things (IoT), artificial intelligence (AI), cloud computing, 3D printing, automation and robotics, blockchain, and data analytics have propelled DT forwards at a breakneck pace, changing not only the digital ecosystem but also how the economy and businesses are run. DT has increased in popularity amongst enterprises and is now a necessary component of any successful business due to several advantageous factors. Indeed, DT can boost domestic industry, strengthen the economy's competitiveness and act as a new pathway for value creation and more extensive structural change, which improves social and economic outcomes (Atkinson and McKay 2007; World Bank 2016). For businesses, digital transformation alters how an organisation runs, particularly in terms of systems, processes, workflow, and culture. This results in lower costs, higher revenue, and improved productivity and efficiency (Alison, Gaurav, and Désirée 2020; Cirillo et al. 2022; Deloitte 2019; ERIA 2019; Tan and Ng 2019). Additionally, it can assist businesses in gaining and maintaining competitive advantages, enhancing organisational flexibility and resilience, and lowering market entry costs, which will increase their customer base and consumer reach (Deloitte 2019; Guo et al. 2020; Von Briel, Davidsson, and Recker 2017).

Increased digital engagement has been shown to be profitable and efficient. For instance, DT helps European businesses streamline operations and lower interaction costs with suppliers and customers, which boosts productivity (Gal et al. 2019). Small and medium-sized businesses (SMEs) in Singapore that implement DT see considerable increases in value-added and productivity of 25 percent and 16 percent, respectively (Tan and Ng 2019). The revenue and productivity gains from DT is found to be larger in Australia. Deloitte (2019) reports that SMEs with advanced levels of digital involvement are 60 percent more productive, 50 percent more likely to be expanding their income, and seven times more likely to export more than companies with basic digital engagement.

The COVID-19 crisis has given a significant boost to the global transformation towards a digital economy. More people are using digital platforms for sales and placing orders for goods and services, which is indicative of a shift in consumer behaviour as well as in digital trade and business operation models (UNCTAD 2020). In terms of economic gains, evidence shows countries with greater receptivity to the digitalisation shift and digital trade have faster economic recovery, suggesting the importance of creating a conducive and robust national digital economy ecosystem. There is also anecdotal evidence that businesses with a higher level of digitalisation are more likely to adopt successful public crisis management strategies and outperformed their competitors during the COVID-19 outbreak. For instance, in Europe, about 30 percent of SMEs have begun developing new products and services with embedded digital technology (RMIT University 2021). Around 69 percent of SMEs have already deployed the technologies required to facilitate remote working. Such widespread digital usage aids SMEs

in improving their adaptability and crisis management. Digitalisation is positively correlated with SMEs' public crisis response tactics and performance, according to a research study of 518 Chinese SMEs (Guo et al. 2020).

Nearly all nations have embraced DT in their economic growth plans due to the fast globalisation of digital transformation and the larger range of benefits it brings to the economy and businesses. The Royal Government of Cambodia (RGC) is one such nation as it increasingly looks to digital technology as a new source of long-term economic growth and, as a result, it is introducing a number of digital technology-related policies with the aim of improving the digital ecosystem and developing ICT infrastructure for inclusive and sustainable development. The Science, Technology, and Innovation (STI) Policy 2020–2030, Cambodia's STI Roadmap 2030, the ICT Master Plan 2020, and the E-commerce Strategy are a few important policies. The Cambodia Digital Economy and Society Policy Framework (2021–2035) was adopted by the government in the midst of the COVID-19 outbreak and economic slowdown with the long-term goal of creating a thriving digital economy and society by laying the groundwork for encouraging digital adoption and transformation in all spheres of society in order to promote new economic growth and enhance social welfare in the "new normal." The Roadmap for Recovery of Cambodia Tourism During and After COVID-19 (2021) outlines eight strategic objectives for the tourism sector, one of which is to promote the use of digital technology to improve management efficiency and boost the productivity of tourism services. It is significant to remember that Cambodia's digital technology is still evolving, with institutional development and a developing digital technology policy framework (UNESCAP 2021).

There is still a low and uneven level of digital adaptation and acceptance among Cambodian businesses. The majority of Cambodia's businesses, or 99.7 percent of its more than 753,670 establishments in 2021, are micro, small, and medium-sized enterprises (MSMEs)[1], which are even more disadvantaged and frequently constrained by a lack of financial resources, inadequate internet infrastructure, and a lack of knowledge about the supporting policy framework. As a result, MSMEs adopt digital technology at a significantly lower rate than large businesses.

MSMEs in tourism are experiencing increased hardship as a result of the industry collapse due to the pandemic. According to The Asia Foundation's rapid assessment of the impact of COVID-19 on MSMEs in the tourism sector in Cambodia, 31 percent of the assessed MSMEs reduced operations, and 47 percent of the MSMEs closed their doors (TAF 2021). During the pandemic, business owners believed there was a high danger of enterprise survival, a concern which is mirrored in the present day with continued apprehension regarding their enterprise. In addition, only 12 percent of MSMEs changed their business model or strategy to accommodate

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[1] We adopt the classification of MSMEs by the number of employees. Micro relates to 1-4, Small to 5-49 and Medium to 50–100 employees. According to the preliminary results of Cambodia Economic Survey 2021 released by National Institute of Statistics in January 2023, 92.8 percent of the total listed enterprises are micro, 6.6 percent are small, and 0.2 percent are medium.

the "New Normal" brought about by the COVID-19 issue, according to the report. Similar evidence of DT adoption taken up by MSMEs during the pandemic is given in AVI (2021). Over 84 percent of MSMEs experienced a drop in revenue, and as a result, a number of them (almost 48 percent) began working remotely and relying on online platforms, particularly social media, for marketing and sales of their goods and services (AVI 2021). Most of them (78 percent) plan to use social media or other digital platforms in their enterprises in the future (*ibid*).

The previously mentioned studies offer information about the effects of COVID-19 on the operations of MSMEs and the rate of DT adoption in terms of using online platforms, which is very useful in developing policies and programmes that promote MSMEs. The studies, however, only capture a few components of DT and are yet to determine the stage of digital adoption using broader information related to DT. The dearth of empirical analysis about the effect of DT on revenue, productivity, and shock resilience is another significant gap in the adoption of DT in Cambodia. This research, therefore, aims to address this knowledge gap by establishing comprehensive DT adoption indicators and empirically assessing the impacts of DT adoption on the business performance of MSMEs in the tourism sector in Cambodia.

As the repercussions from the COVID-19 outbreak continue, more and more businesses are relying on digital technology to reduce risks, streamline operations, and boost productivity. There was a sharp surge in e-commerce activity in Cambodia during the pandemic, along with more people using smartphones, social media, and other digital platforms. According to a study of e-commerce in LDCs, following the COVID-19 epidemic, online grocery sales have increased by more than 150 percent for some online start-ups (UNCTAD 2020). Additionally, there has been a quick increase in e-payments and a change in consumption patterns brought on by the requirement to buy necessities online. Understanding the state of digital adaption and adoption among MSMEs in Cambodian tourism, particularly under the post-COVID-19 recovery framework, is essential given the widespread and ongoing shift to a digital economy and business models which are driven by technology. The research team chose the tourism industry because of its significant economic impact, contributing 21 percent of GDP, 620,000 jobs, and 89 percent of services exported (Sean 2023).

1.2. Objectives of the study

This study is important and timely as it reflects the global trend of increasing digital technology adoption by businesses. The study is also crucial because the RGC places a strong emphasis on developing policies that support the development of the digital ecosystem and technologies that support economic growth and post-pandemic economic recovery in the economic environment's 'new normal'. The purpose of the study is to investigate digitalisation trends among MSMEs in the Cambodian tourism industry and to objectively investigate how adopting new technologies affects business performance. The study specifically want to carry out the following five investigations:

1) To examine the current state and differing levels of DT adoption among MSMEs in the Cambodian tourism sector.

2) To understand MSMEs' perception of opportunities and challenges with regard to DT adoption, especially during the pandemic.
3) To investigate how the COVID-19 epidemic has affected MSMEs' operations and coping mechanisms.
4) To assess the extent to which DT adoption contributes to the performance of MSMEs, particularly in terms of revenue, productivity, and shock resistance.
5) To identify possible digital solutions to encourage the adoption of digital technology and to promote recovery and resilience within MSMEs against potential future external shocks.

1.3. Research methodology

The study's descriptive and empirical analysis was based on firm-level data from the survey of MSMEs in the tourism sector in Cambodia, which was managed by the Cambodia Development Resource Institute (CDRI) with financial support from The Asia Foundation Cambodia. In total, 1,000 MSMEs were included in the overall sample, which were randomly selected from seven provinces: Phnom Penh, Siem Reap, Sihanouk Ville, Kampot, Mundol Kiri, Ratanak Kiri and Koh Kong. The sampling design was based on the three-stage sampling approach. In the first stage, we determined the proportion of micro, small and medium-sized enterprises operating within the tourism industry. Given the desired sample of 1,000, it gave us the following sample for MSMEs: 495 for micro enterprises; 439 for small enterprises; and 66 for medium enterprises. It should be noted that the calculated sample for each size is based on a 95 percent confidence level and 4.5 confidence interval.

In the second stage, we determined sub-sectors within the tourism industry that comprised of accommodation, restaurant and food business, travel agency, transportation, and entertainment. We again used sample frames to determine the relative proportion of enterprises in each sub-sector by their respective size (i.e., micro, small or medium). We then multiplied the resulting proportion with the total sample of each size (acquired in the previous stage) in order to obtain an appropriate number of enterprises for each sub-sector and size.

The final step involved determining companies to interview. We grouped the businesses from all seven provinces in each subsector and categorised them as either micro, small, or medium-sized. A random number of samples was chosen by size and sub-sector as opposed to the targeted sample. For the accommodation category, 83 micro businesses were chosen randomly from the seven provinces, 96 small businesses, and 29 medium businesses. The same method was utilised to obtain the samples for the remaining sub-sectors. There is no set number of example businesses for each province, and the number of sample enterprises for each province is not pre-determined.

We employed a set of pre-defined questions to gather the relevant business data from each enterprise. The questionnaire captured a wide range of information which was grouped into seven main sections: 1) basic enterprise information; 2) sales and coping strategies in relation to the COVID-19 shock; 3) employment and skills; 4) access to finance; 5) digital technology adoption; 6) challenges and opportunities related to digital technology adoption; and 7)

awareness of government policy and suggestions. The survey form is programmed in the CSPro application and transferred to the Tablet as a tool for data collection. The survey, which was carried out by 21 skilled enumerators, began on October 19 and ran through November 5, 2022.

For empirical analysis of the impact of DT adoption on firm performance, we used a firm heterogeneity framework to empirically analyse how DT adoption affected firm performance. We make the assumption that firm performance is a function of DT adoption as well as other firm features. Revenue and labour productivity are the two factors used to measure a company's performance, whereas DT adoption is proxied by the amount invested in DT as well as the stage of DT adoption. The estimating model also takes into account the firm's size, age, foreign ownership, access to finance, skill intensity and training. To control for the unobserved factors that may affect firm performance across different sectors and locations, our econometric specification also includes sector-fixed effect and location-fixed effect. The ordinary least squares (OLS) approach is used to estimate the regression.

1.4. Structure of report

The remainder of this paper is organized as follows: Section 2 provides a brief overview of the sample MSMEs covering key characteristics such as registration, access to finance and perception of obstacles to financing. Section 3 examines the current state of DT adoption among MSMEs with an emphasis on the DT adoption stage, barriers to and benefits from DT adoption. The effects of COVID-19 on MSMEs' operations, and coping mechanisms are examined in Section 4. Section 5 elaborates on empirical specifications and findings on the impact of DT adoption on firm performance. Finally, Section 6 concludes and provides policy suggestions.

2. SAMPLE OVERVIEW

2.1. Sample distribution

The survey sample consisted of micro, small, and medium-sized enterprises from Phnom Penh and six provinces. Figure 1 presents the sample distribution by its geographical location. Sixty-five percent of the enterprises are located in the capital. The coastal and historical areas account for another 32 percent. The last and smallest portion of the sample comes from the mountainous region, specifically from Ratanak Kiri and Mundol Kiri.

Figure 1: Surveyed MSMEs by geographical location
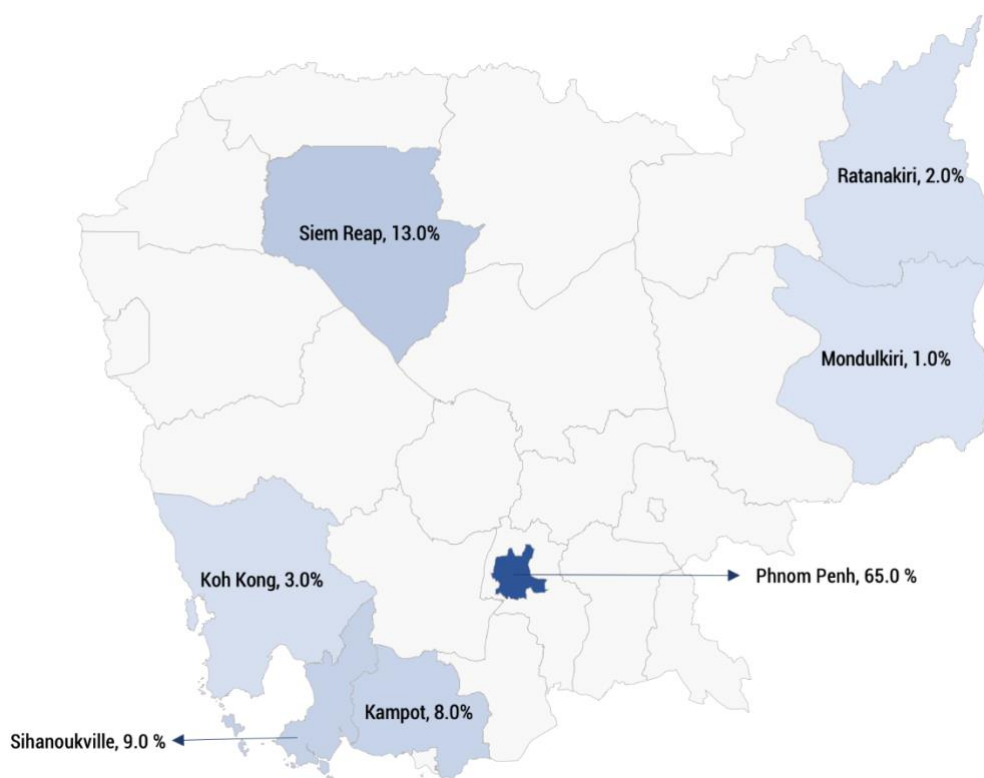
Half of MSMEs are micro enterprises, followed by 47 percent being small enterprises and 3 percent medium enterprises (refers to Table A. 1). The survey businesses are further broken into four main sub-sectors: restaurant and food business (70.7 percent); accommodation (21.4 percent); travel agency and transportation (6.1 percent) and entertainment (1.8 percent) (refers to Table A. 2). Hotel, bungalow, guesthouse, and resort MSMEs are included in the accommodation sector. Meanwhile, examples of entertainment MSMEs include massage/spa salons, karaoke, disco, and beer gardens.

2.2. Major characteristics of surveyed MSMEs

A majority of the enterprises (63.1 percent) began operation between 2010 and 2019, followed by 23.8 percent which began their operation between 2020 and 2021 (Figure B. 4). The remaining 13.1 percent consists of older firms whose operation started before or up to 2009. On average, the enterprises have operated for 6.75 years. The average years of operation does not differ significantly based on the firm size and sector of MSMEs. In terms of formality, almost half of the surveyed MSMEs (47.8 percent) are registered, and the other half (49.3 percent) are not. For this survey, registration refers exclusively to the registration with the Ministry of Commerce, registration with the tax department and the Ministry of Labour and Vocational Training were not included. The registration status of businesses varies according to their size. As illustrated in Figure 2, while two-thirds of micro-sized businesses are unregistered, roughly the same proportion of small-sized businesses are registered. In contrast, every medium-sized enterprise is registered.

6

Figure 2: Registration status by firm size
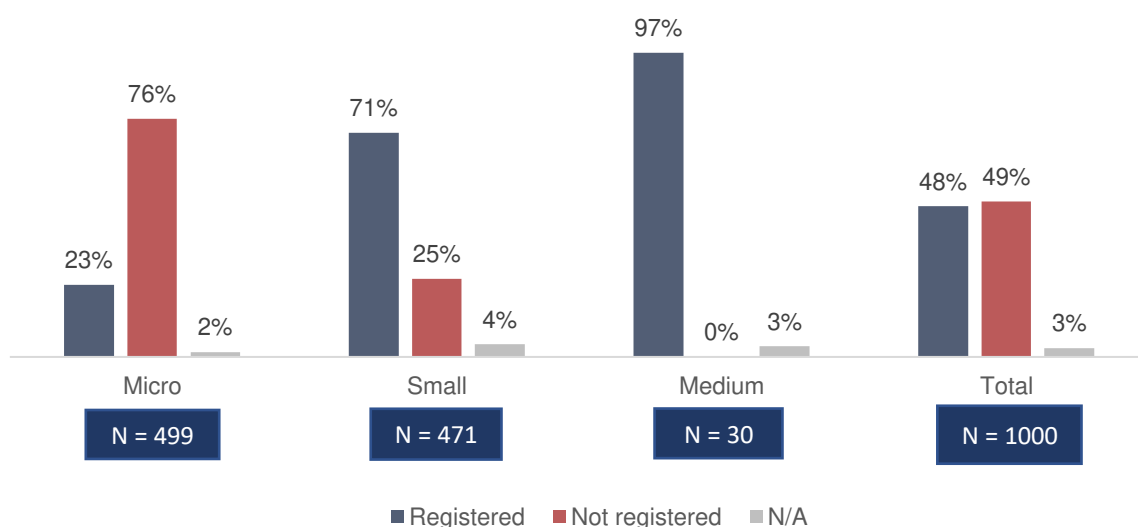
The registration status also varies significantly based on the gender of the owner or top manager. Among businesses with male owners or top managers, 60.8 percent are registered businesses, compared to only 35.7 percent of companies with female owners or top managers (see Figure B. 2). The findings further indicate that MSMEs are predominantly owned locally, with an average domestic share of 93.6 percent. The average domestic share is higher for micro (98.7 percent) and small (89.2 percent) enterprises, compared to medium-sized enterprises (73.3 percent). Only seven percent of the surveyed MSMEs have foreign shares.

Employment structure is another important characteristic of small and medium-sized enterprises. On average, women account for 60 percent of the total workforce. This percentage decreases as the enterprise's size increases. The average percentage of female employees in micro-sized enterprises is 67.9 percent, followed by 53 percent in small enterprises and 45.6 percent in medium-sized enterprises. Overall, slightly more women than men hold executive positions with significant influence over the operation of the enterprise (52 percent versus 48 percent). The World Bank Enterprise Survey in 2016 also reported that 57 percent of enterprises in Cambodia (large, medium and small) are managed by women (World Bank 2017). From our survey and as shown in Figure 3, the female proportion is only higher than that of males in micro enterprises and in the restaurant food sector. Specifically, there are 15.5 percent more female top managers than male top managers for microenterprises and 13.9 percent more female top managers for the restaurant and food industry. In the remaining firm sizes and sectors, male top managers outnumber female top managers. This pattern continues to be evidenced in the reported education level of top managers. The percentage of female managers with a diploma or higher education is lower than that of males (44 percent versus 56 percent). In contrast, the proportion of female managers with secondary education or lower is greater than that of males (62 percent versus 38 percent).

Figure 3: Gender of top manager by firm size and sector
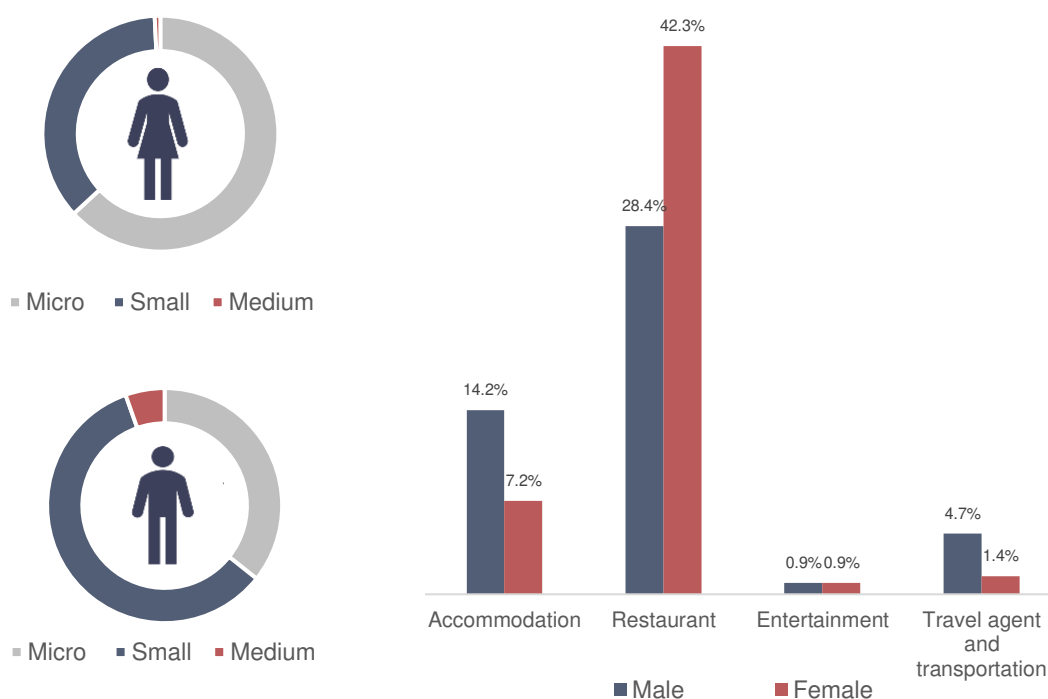
The workforce in the tourism sector is generally low-skilled. Half of the full-time employees had education at or below the lower secondary level (Table 1). Another one-fifth attained up to higher secondary education. Only 16 percent have attained higher education. In this industry, mid-skilled and low-skilled workers[2] are dominant. Aside from management staff (36 percent), they account for almost fifty percent (23 for mid-skilled and 26 for low-skilled) of the reported full-time employees. In contrast, high-skilled workers account for only 14 percent. There is no significant difference between subsector disaggregation and firm size.

Our survey also revealed limited access to training. Only one-quarter of the MSMEs surveyed said they offered training to their employees. Access to training varies based on the size of the enterprise. Larger businesses are more likely to have provided their employees with training. Overall, 70 percent of medium enterprises reported having done so, followed by 37.4 percent for small enterprises and 12 percent for micro enterprises. Interestingly, enterprises in the accommodation (30.8 percent) and restaurant and food business (25.7 percent) are more likely to have provided training for their employees than those in other sectors.

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[2] In this study, skilled workers are classified into three level and are defined as follow: **1) High-skilled**: workers that received higher education/advanced academic degree and long years of experiences to perform tasks requiring advanced knowledge and technical expertise; **2) Mid-skilled**: workers that received basic education, have some experiences, and training necessary for performing tasks requiring basic knowledge specific to one technicality; and **3) Low skilled workers:** workers that received little education or experience or none, for performing routine works without knowledge needed on specific technicality.

Table 1: Education level of employees

Education Level	N	(%)
None	449	6%
Primary education	1838	25%
Lower secondary education	1852	25%
Higher secondary education	1799	24%
TVET	221	3%
High school diploma	140	2%
Bachelor's degree	1118	15%
Master's degree	63	1%
PhD	8	0%

Soft skills training is more common than technical skills training among those surveyed. Work ethic (23 percent), interpersonal and communication skills (18 percent), and managerial and leadership (8 percent) are the top three soft skills taught. The most frequently reported types of technical training are culinary/drink-making skills (19 percent) and hospitality skills/accommodation management skills (14 percent). Notably, training on digital technology and its related skills is rarely reported (2 percent). In the context of the Fourth Industrial Revolution (4IR), however, soft skills continue to be of critical importance. For instance, written and verbal communication skills, social skills, and critical thinking and active learning are among the top ten skills that are increasingly relevant in the tourism industry from 2018-2030 (ADB 2021). This is because 4IR will likely accelerate the shift in time spent from routine tasks to nonroutine and analytical tasks.

Access to finance is a critical factor in sustaining businesses. Overall, 25.9 percent of surveyed MSMEs reported having an existing line of credit from a formal institution. Meanwhile, only 16.9 percent reported borrowing from informal sources. Enterprises in the travel agency and transportation, as well as the restaurant and food business sectors are more likely to have an existing line of formal credit, in comparison to the other two sectors. Micro enterprises report formal loans more frequently than small and medium businesses. Private commercial banks and microfinance institutions are the top sources of formal credit, whereas, family/relatives and private lenders are the main sources of informal credit. Despite the economic shock caused by the pandemic, unnecessity (69.9 percent) is widely cited by MSMEs as the reason for not having an existing line of formal credit. Debt repayment concerns (13.44 percent) are also cited as a factor. This number rose to 18.2 percent for micro enterprises, compared to 6.3 percent and 0 percent for small and medium enterprises, respectively. Among all surveyed MSMEs, 60.1 percent viewed their inability to obtain loans as an obstacle to their business operation (Figure 4). Within these responses, only 2.9 percent and 17.5 percent perceived it to be a very severe and major obstacle, respectively. Another one-fifth perceived it to be a moderate obstacle, while the remainder view it as a minor obstacle (18.8 percent).

Figure 4: Firms' view on degree of obstacle when loan is not accessible
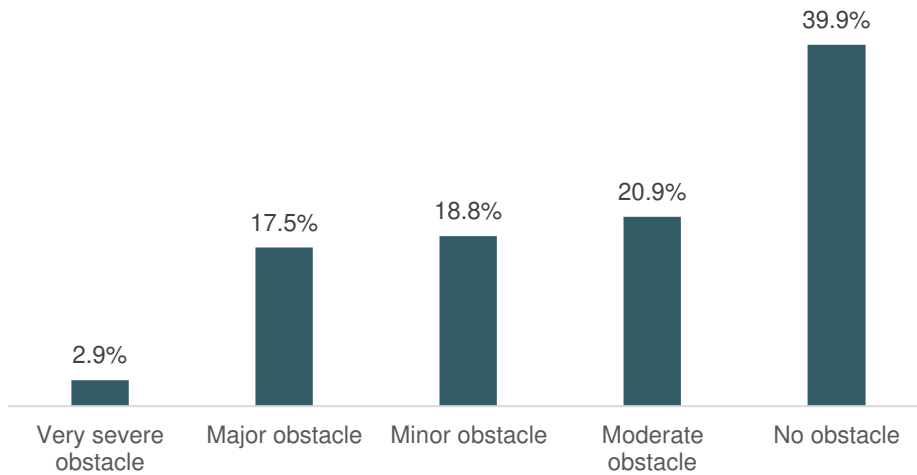
In terms of financial technology adoption, 80.2 percent of all surveyed MSMEs have introduced digital payment systems as their payment method. The accommodation sector has the highest adoption rate at 91.1 percent (refers to Figure C. 1). Micro-sized businesses have the lowest adoption rate at 64.5 percent, compared to 96.7 percent and 95.8 percent for medium and small businesses, respectively (Figure 5). ABA, ACLEDA, and Wing are, in order of popularity, the top three digital payment applications utilized by MSMEs (refers to Figure C. 2).

Figure 5: Firms' adoption of digital/e-payment by firm size (percentages)
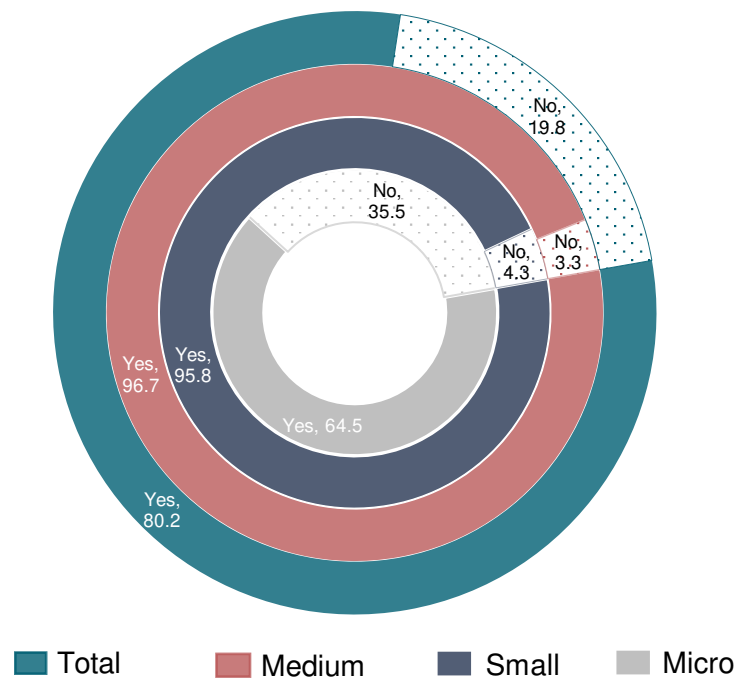
3. MSMES DURING COVID-19 PANDEMIC AND THEIR COPING STRATEGY

3.1. Impacts of COVID-19 on MSME's activities

The impact of COVID-19 on MSMEs is a topic of discussion for many. Numerous sources have described how COVID affects the operations of MSMEs. Several of these include reduced operations, decreased revenue, and a threat to the business's survival. However, the negative effects facilitate a new opportunity for digital adoption. The increasing use of digital payment methods and transitioning to online business models are among the newly adopted practices. This survey corroborates the earlier findings on such topics.

The four most reported changes that MSMEs experienced in 2021 due to COVID-19 are the temporary suspension of activities (31.9 percent), lay-off of employees (20.22 percent), reduced production (16.36 percent), and switch to online sales (12.89 percent). These changes have had a substantial impact on business revenue. When compared to the period prior to COVID-19, 71.7 percent of the surveyed MSMEs reported lower revenue (

Figure 6). On average, MSMEs reported a 62.37 percent decline in revenue. The subsector with the highest average revenue decline, 85 percent, was the entertainment industry, followed by accommodation (73.06 percent), travel agencies, and transportation (70.51 percent). The extent of the negative effect of COVID-19 on revenue is greater in this survey than in other previous studies. As previously reported by The Asia Foundation (2020), the majority of MSMEs in the tourism industry experienced revenue declines of more than 50 percent due to the COVID-19 crisis. In a separate study, Seng (2022) found that 55.8 percent of their surveyed enterprises experienced a drop in sales of more than 50 percent.

To mitigate these effects, the government has provided various forms of assistance to the private sector, particularly the tourism industry. In contrast to the 49.12 percent of surveyed MSMEs who said they did not receive any government assistance, 23.03 percent and 21.09 percent said they had received tax and rent deferrals, respectively. Despite being offered, almost none have received assistance in the form of access to low-interest loans or assistance with skill development.

Figure 6: Revenue changes compared to the pre-COVID-19 era in 2019

Category	Percentage
Decreased	71.7%
Not relevant	17.7%
Remained the same	4.7%
Increased	3.2%
Don't know	2.7%

Average % of decreased revenue

62.37 PERCENT

Average % of decreased revenue by

Firm size

Micro	Small	Medium
60.91	63.52	67

Sex of top management

Female	Male
60.77	63.98

Sub-sector

Restaurant/food business	Travel agency and transportation	Accommodation	Entertainment
57.46	70.51	73.06	85

Registration

Not registered	Registered
56.71	67.52

3.2. The COVID-19 and digital technology strategy

COVID-19 has unquestionably altered business practices, albeit to varying degrees. Overall, 72 percent of surveyed MSMEs reported digital changes in their business functions. Figure 7 illustrates that the most frequently reported change in business functions is the payment method (31.4 percent), followed by sales (18.4 percent) and marketing (14.8 percent). Other studies also highlighted the changing means of operation used by enterprises as a result of COVID-19 by transitioning business to online platforms (AVI 2021). However, micro enterprises are less likely to report changes. Indeed, the share of micro enterprises not reporting any changes is 46 percent, compared to only 15.7 percent and 2.7 percent for small and medium enterprises.

Figure 7: Percentage of reported adoption/increased use of digital technology in business functions in response to COVID-19
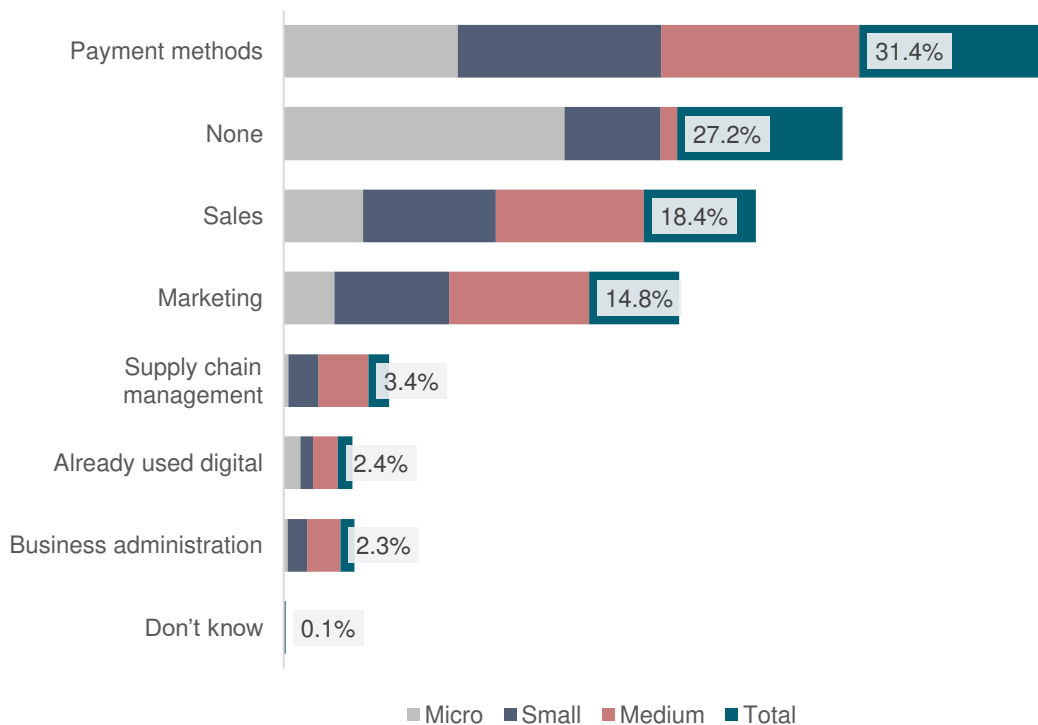
About half of surveyed MSMEs (52.9 percent) reported having invested in new technologies, equipment, or digital solutions in response to COVID-19 between 2020 and 2021. Compared to enterprises led by female managers/owners, enterprises led by male managers/owners are more likely to invest in digital technology (63.07 percent versus 43.44 percent). Moreover, micro enterprises are less likely to invest in new digital technology, relative to small and medium enterprises (Figure 8).
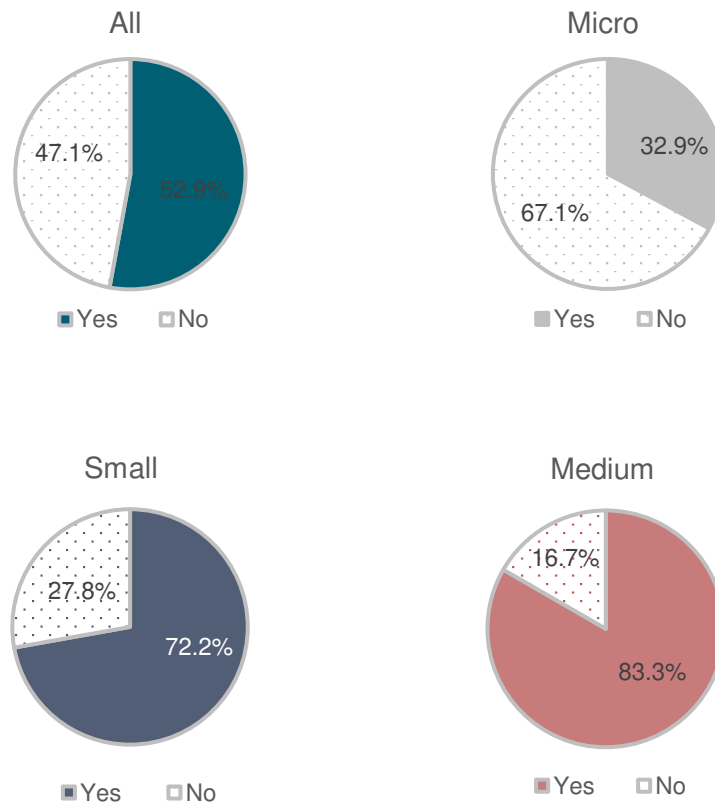
The amount invested in technology varied based on items. As shown in Figure 9, in 2021, there is a large difference in the average value of the investment between investment in e-commerce/digital platforms and other forms of technology. Typically, businesses invest more in e-commerce/digital platforms (USD 322.09) than they do in software (USD 21.75) and hardware (USD 79.97). Interestingly, the average amount of investment on e-commerce/digital platform is higher for small firms (USD 394.63) compared to micro (USD 154.49) and medium (USD 160.76) firms, as provided in Figure 9.

Figure 9: Average annual investment in technology in 2021

95% confidence intervals
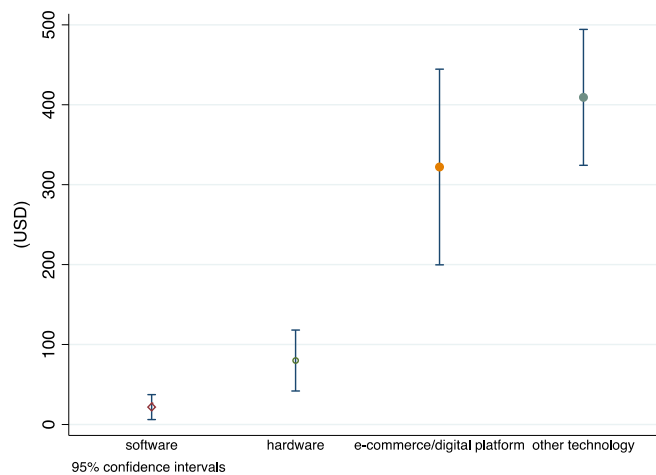
As presented in Figure C. 3, enterprises that did not invest in new technology assert that new digital solutions are not necessary (50 percent). Some of them also cited a lack of information and skilled employees (25.45 percent) as deterrents to invest in new technology. The high initial investment cost is another factor contributing to this discouragement (7.44 percent).

4. CURRENT STATUS OF DIGITAL TECHNOLOGY ADOPTION

4.1. Definition and classification of digital technology

The term "technology" refers to a method of accomplishing a task, particularly through the use of technical processes, methods, or knowledge. It includes both the machinery or "hardware," and the process or method. Digital technology, on the other hand, refers to the transformation of information from its physical materials into bits, highlighting its primary benefit in reducing economic costs (Cirera, Comin, and Cruz 2022). Similarly, the Cambodia Digital Economy and Society Policy Framework 2021 – 2035 defines digital technology as the generation, storage, process, and analysis of data using electronic tools, smart devices, telecommunication systems, information technology systems, and computing resources. In addition, the term 'digital adoption' refers to individuals' ability to understand and adapt to the never-ending evolvement of digital technologies deeply rooted in business, economy, and society.

Digital adoption can be classified into three levels: basic, intermediate, and advanced (ERIA 2019; SME Corporation Malaysia 2018). Basic digital technology (BDT) refers to the usage of simple devices ranging from smartphones to tablets and basic software, such as Microsoft, for communication and daily operational tasks (refers to Figure 10). Intermediate digital technology (IDT) focuses on leveraging technologies for front-end tasks such as sales/marketing through online platforms, including social media, digital/e-commerce platforms, websites, and payment through digital technology (e-payment).

Figure 10: Classification of digital adoption levels
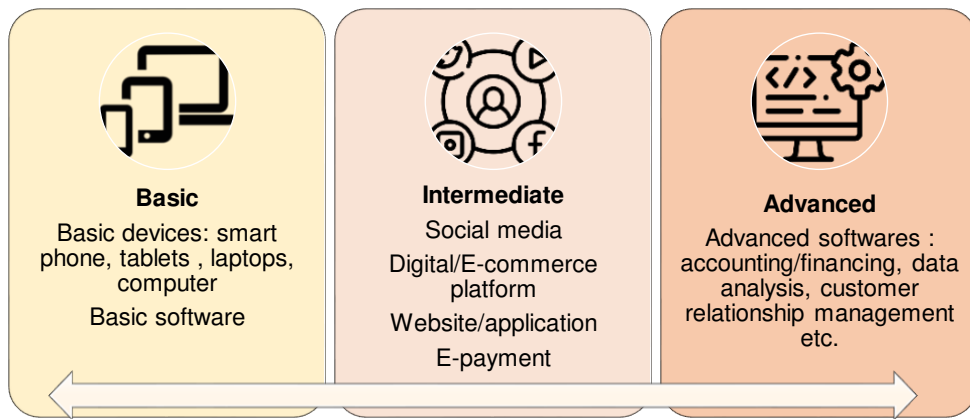
Source: ERIA (2019)

On the other hand, advanced digital technology (ADT) refers to advanced software used to effectively and productively complete back-end tasks such as financing/accounting, data analysis, customer relationship management (CRM), etc. The subsequent analysis will adhere to this classification in order to comprehend the varying degrees of DT adoption among MSMEs within the Cambodian tourism sector.

4.2. Digital adoption level

In Figure 11, 60 percent of the interviewed MSMEs are at the Basic level, employing digital technology sparingly to improve communication and simple operations. Meanwhile, 30 percent are at the Intermediate level as they extend their use of digital tools to support the sale, marketing, and payment mode. Only 10 percent of MSMEs interviewed climbed up to the Advanced level, employing advanced digitalisation in multiple aspects of their business. When compared to a survey of MSMEs conducted across the 10 ASEAN member states by ERIA (2019), the level of DT adoption exhibits a similar trend to the present study.

Figure 11: Level of digital technology adoption
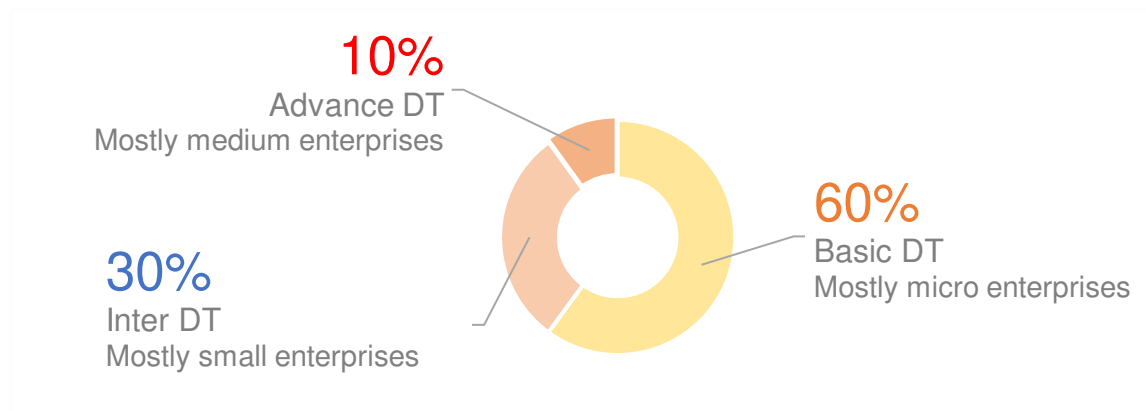
The study also found that digital adoption is uneven across major characteristics. Those at the lowest level are predominantly comprised of micro-sized (69 percent), unregistered (61 percent) and women-led businesses (69 percent), while those at the intermediate and advanced level are respectively dominated by male-led and registered businesses (Figure C. 5). Regarding business size, 69 percent at the intermediate level of digital adoption are small businesses while 20 out of 30 medium businesses are at the advanced level of adoption. Almost every MSME surveyed, regardless of their size or sector, have adopted the basic level of digital technology for communication and operations. However, the adoption is predominantly driven by smartphone usage. Integrating a greater variety of devices - such as laptops, desktops, tablets, and basic software like Microsoft Office - into the workplace is still low.

Figure 12: Access to basic digital technologies

Smartphones	Desktops	Tablets	Laptops	Basic software
95%	14%	28%	5%	29%
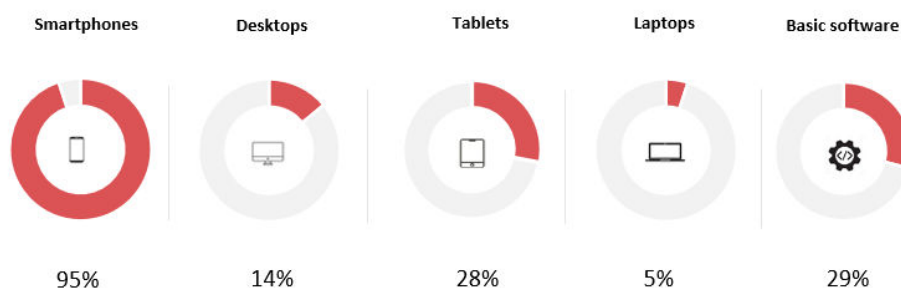
About 47 percent of MSMEs reportedly use social media, primarily Facebook, Telegram, and Instagram, for a variety of purposes, including selling, accepting orders/bookings, customer engagement, and marketing communication, in order to increase their business reach (see Figure 13).

Figure 13: Usage of online platform technologies

Micro | Small | Meduim | Total
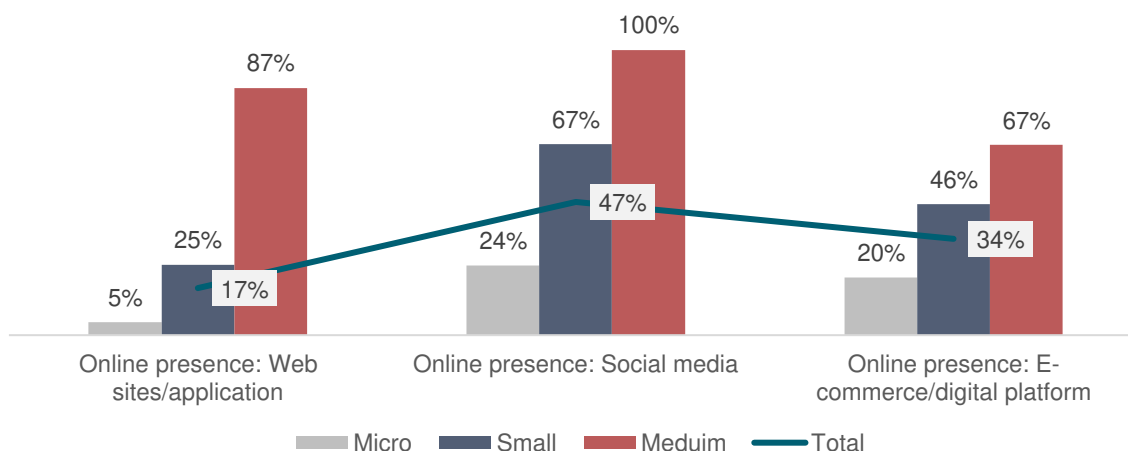
Even though these social media channels have become widely accessible, and most people[3] are already familiar with these platforms for personal use, micro firms are less likely to adopt this technology for business purposes. Indeed, adoption rates for micro-businesses are 24 percent compared to 67 percent and 100 percent for small and medium-sized businesses, respectively. In addition to social media, 34 percent of MSMEs use digital/e-commerce platforms for their businesses, primarily meal delivery applications and booking platforms.

In recent years, there has been a high uptake of e-payment usage, fuelled by increased internet penetration, rising mobile phone usage, supportive regulatory frameworks, and more recently the risk of COVID-19 transmission, which in synergy encourage people to opt for cashless payments (NBC 2021). Although e-payment methods have become a standard practice amongst larger enterprises, this technology has peculiarly accelerated the digitalisation of micro-enterprises as evidenced by a high proportion (65 percent) of micro-businesses accepting this payment method. This is despite the fact that 20 – 24 percent of micro-enterprises had expanded their operations online (refers to Figure 14). The adoption of e-payment methods has outpaced online platform usage which demonstrates that this approach is applicable to both online and offline purchases.

Figure 14: Businesses adoption of e-payment methods by size
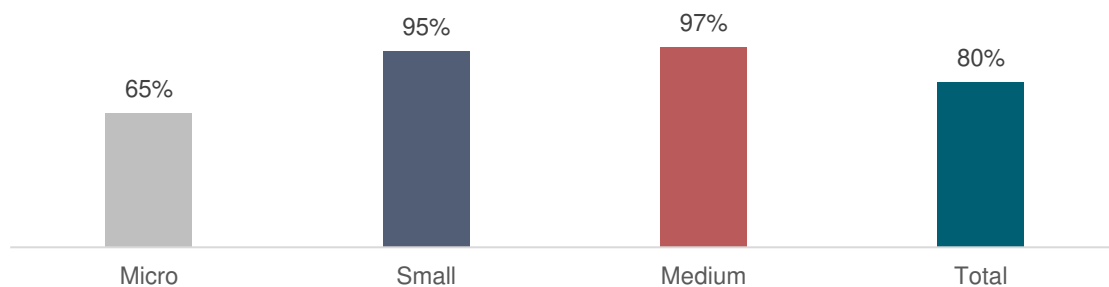
Website/application technology represents a significant intermediate digital technology adoption gap. In contrast to a third-party platform, where creating a business account is as simple as clicking a button, setting up one's own business website/application requires an investment of money and expertise to build or manage its operation. Not surprisingly, the majority of medium enterprises surveyed (87 percent) have websites or applications dedicated to their business, while only 25 percent of small enterprises do (Figure 13).

Most MSMEs do not practice any operational tasks when it comes to the tools used to perform back-end tasks. Others that do rely solely on manual paper-based task completion or basic software like Microsoft Office (Figure C. 6). Only 4–11 percent of MSMEs surveyed, the majority of which are medium-sized businesses and the minority, small businesses, have invested in specialized software or generalized software (ERP) for their operational tasks.

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[3] According to Statista, 74 percent of Cambodians are active social media users in 2022, a considerable jump from 2016, when only 27 percent of the population was on social media. Based on a survey of participants aged 15 to 65, Facebook is the most popular social media (70 percent of respondents), followed by YouTube (28 percent) (Phong and Solá 2015).

Using advanced software for producing accounting or financing reports is common among registered businesses. It has also become prevalent to use automated chatbots and digital advertisements on websites, digital platforms, and social media. However, only a minority of MSMEs reported adopting advanced technologies for CRM and data analysis.

Table 2: Percentages of firms by advanced digital technologies adoption

Advanced software	Micro, N = 499[1]	Small, N = 471[1]	Medium, N = 30[1]	Total, N = 1000[1]
Advanced software: accounting/finances	1%	19%	57%	11%
Advanced software: CRM	0%	7%	27%	4%
Advanced software: marketing	2%	12%	47%	8%
Advanced software: data analysis	1%	10%	23%	6%

[1] n

4.3. Current trend of online sale

More than half of the survey respondents (55 percent) reported using at least one online platform for their business, including social media, digital platforms, and websites/applications. However, this information only indicates that they have an online presence but does not necessarily discern whether they practice online selling or the degree of online sales within their business. To distinguish online sales from offline sales, each respondent was asked to provide a share of the sale generated by online channels in 2021.

Figure 15: Proportion of businesses participating in online sales

Micro 18%
Small 46%
Medium 67%
Total 33%
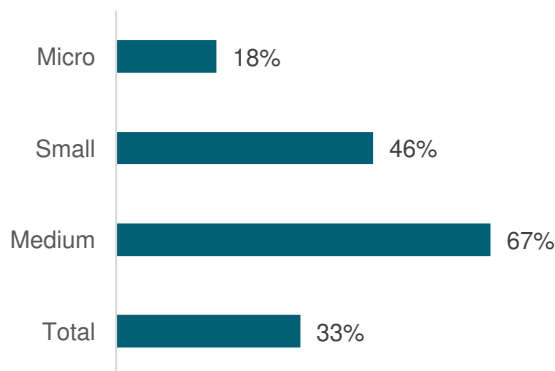
Figure 16: Median of online sales share

Restaurant/food business 30%
Accommodation 25%
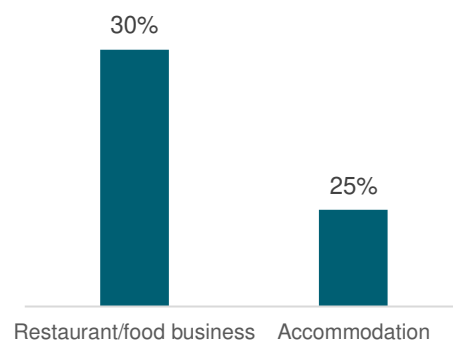
The survey revealed that 67 percent of respondents do not practice online sales (Figure 15). Among those MSMEs that do, the majority are medium and small enterprises, with the share of online sales varying slightly between the two leading industries, restaurant and accommodation. In fact, MSMEs in the restaurant/food business industry (30 percent) were observed to use online sales to a greater extent than their accommodation sector counterpart (25 percent). This dominance of the food business in online sales could be attributed to the

recent boom in digital meal delivery platforms, especially during the pandemic crisis, as the revenue generated from online food delivery in Cambodia reached USD19.8 million in 2022 (Statista 2022).

4.4. Digital adoption and gender parity

Gender disparity in digital adoption is noticeable and behaves differently between the education level of managers. In fact, the digital adoption rate for basic and intermediate technologies (basic devices, basic software, websites, social media, and e-payment) among female managers with low education levels[4] were all significantly lower than their male counterparts (sees Figure 17). On the other hand, the adoption rates for advanced software (e.g., accounting/finance software, CRM software, marketing software, data analysis software) were equally low for both genders (with the same level of education).

Figure 17: Disaggregation of digital technology adoption by gender and education level

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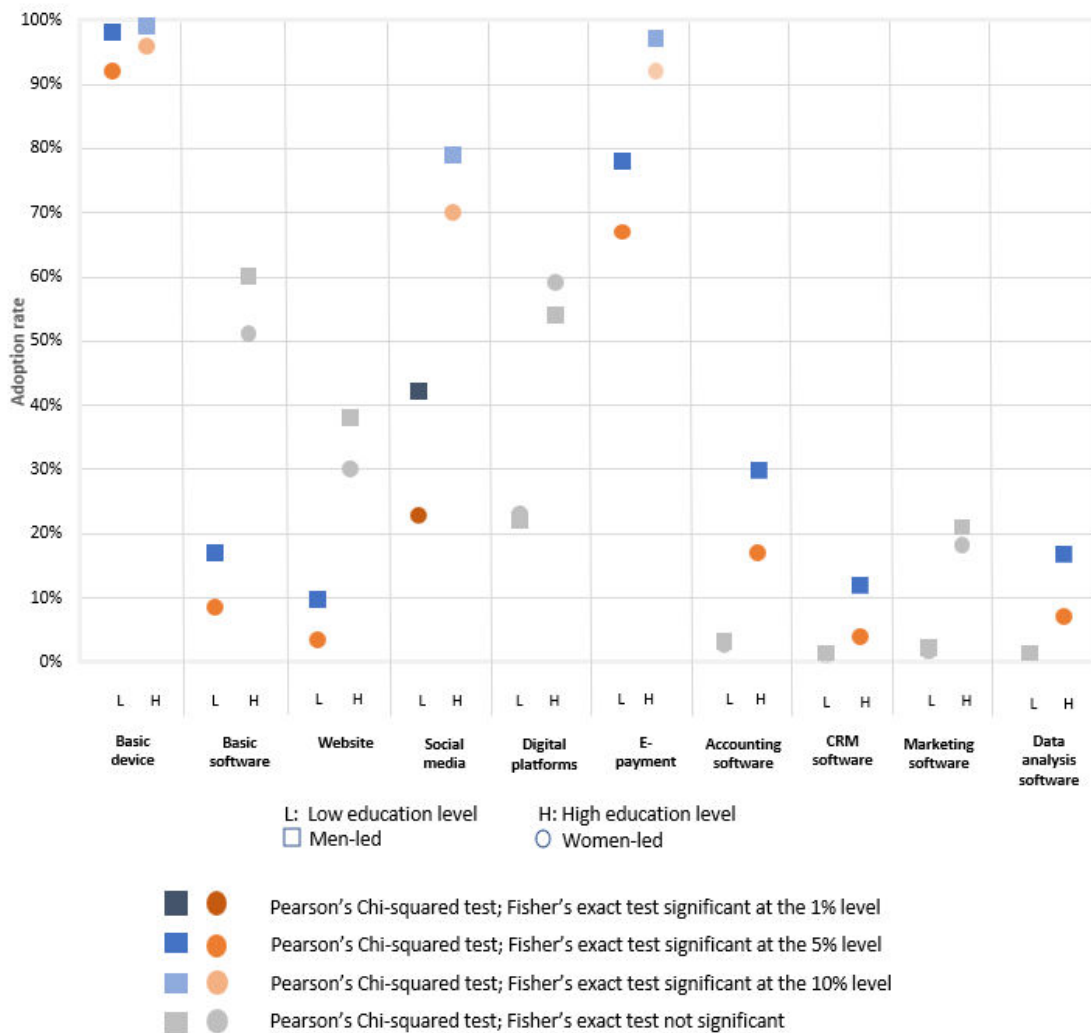
[4] Managers with low education level refer to those who had not completed tertiary education.

The result is found to be the opposite among highly educated managers[5]. There is no significant association (at a significance level of 5 percent) between gender and the adoption of basic and intermediate technologies. However, the gap lies in advanced technology, where highly educated male-led businesses tend to utilize these tools more than their female counterparts. This finding suggests that even though education tends to favour gender parity in digital adoption, a threshold may exist where women-led businesses are only equal amongst intermediate technologies and lag behind at the advanced technologies onwards.

4.5. Barriers to digital technology adoption

Given that the majority of MSMEs are at the bottom of the digital technology adoption ladder, it is of the utmost importance to investigate the obstacles or challenges they have faced along their digitalisation journey. One of the obstacles listed in the survey is a lack of skilled personnel. This does not refer exclusively to advanced skills such as programming, but also includes an understanding of the business context and the information and communications technology (ICT) environment, including the ability to use fundamental software such as Microsoft Office (Figure 18). Despite this expansive definition, a lack of this skillset emerged as the primary barrier for MSMEs (58 percent). The perception of a lack of skills is similar among enterprises at different stages of digital adoption. Only 13 percent of surveyed MSMEs, which are predominantly medium-sized businesses, employ personnel with ICT degrees, reflecting the issue of insufficient skills. This problem seems to have a deeper root as 70 percent of Cambodia's population is digitally illiterate (Nai 2022). Despite the impressive improvement in human capital development over the last decade, this problem highlights an urgent need for digital education and training among the MSMEs' labour force as well as the labour force as a whole.

Figure 18: Barriers to digital adoption

During the previous two decades, the costs of digital adoption (electronic devices and information technology [IT] services) and internet connection have decreased considerably.

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[5] Highly educated managers refer to those who had completed tertiary education.

Digital platforms, on the other hand, have taken a different approach and avoided charging hefty upfront fees by favouring profit-sharing arrangements or charging lower fees regularly (ERIA 2019). Despite these factors, the present survey found that 28 percent of MSMEs cited having a lack of budget as a barrier. In contrast, 32 percent of respondents have doubts about the return on digital investments, fearing they will not be able to recoup their investment due to weak business cases. The contradiction between the availability of inexpensive digital technologies and the perceived high cost by MSMEs could be explained, at least for low-level technology businesses, by the fact that these MSMEs are unaware of how readily available these digital solutions are today. Furthermore, the uncertainty regarding digitalizing is found to be greater in businesses with a lower degree of digital adoption, suggesting that businesses are hesitant to initiate or increase their digitalisation when they are in the early stages of digitalisation (Figure C. 7). However, once they have adopted the technology, their fear will gradually subside, making low-level technology MSMEs the most promising group for digitalisation propagation.

Lastly, the absence of industry standards is also mentioned as a barrier (13 percent), mainly among businesses at a low level of digital adoption. Digital technology is a complete buzzword for 40 percent of MSMEs surveyed, while another 35 percent have a limited understanding of that term (Figure C. 11). In addition, this low awareness of digital technology was found to be prevalent among unregistered, women-led and micro businesses, suggesting a customized policy is critical to address this barrier (Figure C. 12). Furthermore, the majority of top managers from the MSMEs surveyed were found to have low educational attainment; 42 percent did not complete their upper secondary education. In light of this, a lack of awareness among business owners and the dearth of qualified personnel resulted in 12 percent of the sample's MSMEs citing a lack of expert advice as another obstacle. This issue is more prevalent, particularly among MSMEs at the intermediate and advanced levels of technology adoption, as they have reached a tipping point that necessitates more refined and expert advice in order to achieve greater digital sophistication.

4.6. Opportunities from digital technology adoption

4.6.1. Perception of digital technology adoption

There are three categories of benefits for digitalisation perceived by MSMEs. One of these is the chance to increase business outreach through the use of social media and digital platform technology; according to the survey, 34 percent of MSMEs report an increase in their customer reach, and 23 percent say it gives them access to better marketing tools (Figure 19). This benefit may be explained by the fact that MSMEs with an online presence on social media, digital platforms, or websites typically have an opportunity to reach out to a wider customer base. On the contrary, offline businesses are highly likely to rely on a narrow customer base that is restricted to a small geographic footprint. Furthermore, these platforms offer additional features that allow businesses to personalize the location, age, gender, and interests of the people they want to reach with their advertising campaign. One illustration of such features is Facebook's customized business advertising, which leads to a more effective targeting

marketing tool (Shanahan, Tran, and Taylor 2019). Moreover, 43 percent of MSMEs cited improved customer services as a benefit of adopting digital technology.

Figure 19: Perceived benefits from digitalisation
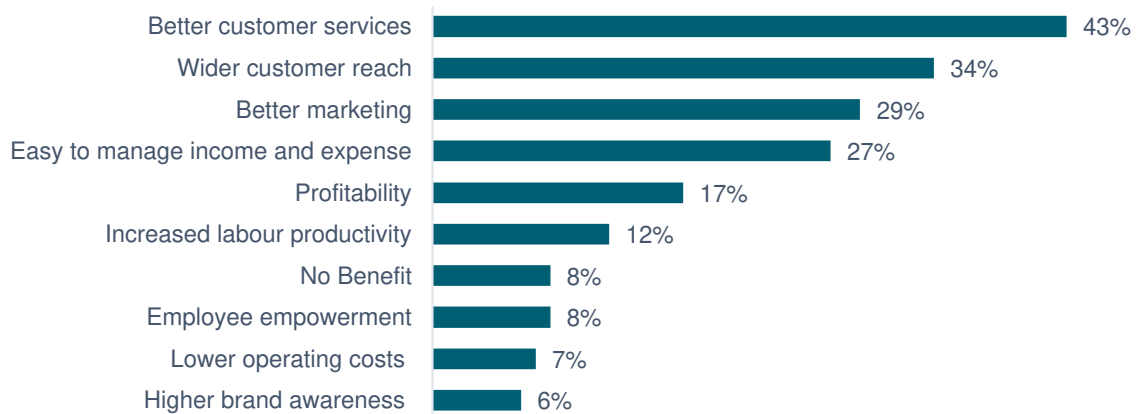
According to the survey, the cost-benefit ratio associated with the adoption of digital technology increases significantly for MSMEs with more advanced technology, possibly through the use of sophisticated software for operational tasks (
Figure C. 8). Information technology has a long history of lowering costs and increasing outputs by automating fundamental, repetitive tasks. There is evidence that investing in information technology to improve procedures and automate transactions yields corporate benefits such as faster processing, labour substitution, and increased operation volumes (Shang and Seddon 2000). As a result, some advanced-level technology MSMEs (19 percent) witnessed a reduction in operating costs and many others (29 percent) experienced an increase in profitability. Similarly, about 29 percent of MSMEs cited a rise in labour productivity from digitalisation and 40 percent of them claimed DT can facilitate and simplify business operations, especially financial management.

4.6.2. *Plan for digitalisation*

The more advanced MSMEs become in their digital adoption, the greater the benefits they perceive from digitalisation. Therefore, MSMEs that have already adopted digital technologies are more likely to invest in further advancing their adoption than those in the nascent stage. This ambition could potentially exacerbate the existing digital adoption gap in the future, highlighting the pressing need to promote digitalisation among MSMEs with a lower level of digital adoption. In addition to investing in ICT devices, software, and digital solutions, those who plan to increase their use of digital technology cite digital skill training and seeking expert advice as improvements necessary for their digital transformation.

Figure 20: Digitalisation plan
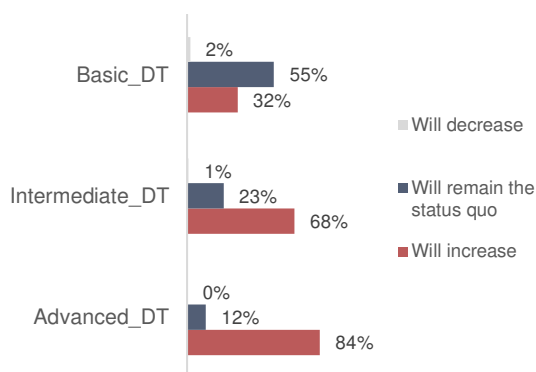
Figure 21: Efforts to increase digitalisation

Figure 20 labels:
- Basic_DT: 2%, 55%, 32%
- Intermediate_DT: 1%, 23%, 68%
- Advanced_DT: 0%, 12%, 84%

Legend:
- Will decrease
- Will remain the status quo
- Will increase

Figure 21:
- More training on digital skills — 69%
- Seeking more expert advice — 38%
- More Investment in ICT devices — 35%
- More Investment in ICT software and digital solutions — 29%
- Seeking more government supports — 10%
- Joining business network — 9%
- Doesn't need any digital transformation — 4%
- Other — 3%

4.6.3. Awareness, access, and need for government support

Regarding government support, only a minority of MSMEs prioritize seeking government support as a means to enhance their acceleration in digital transformation (Figure 22). In fact, the vast majority of MSMEs are either unfamiliar with or have limited understanding of government support for digitalisation. Similarly, the reported number of firms having moderate or good understanding of the available support remains very low. This pattern is unchanged when disaggregating the firms' size, sub-sectors, registration status and sex of top manager (Figure C. 13 and Figure C. 14). In addition, the variation of awareness level is statistically significant (at less than 5 percent significance level based on Chi-square test) depending on these factors. Micro firms tend to report that they are unfamiliar (83 percent) with the government policies and supports more than small (64 percent) and medium (33 percent) sized enterprises. On the other hand, the unregistered firms reported lower awareness at all levels compared to registered firms. Female-managed firms are also less aware of the policies and government support in comparison to firms managed by males.

Surveyed firms rely primarily on word-of-mouth and social media for information. A minority are contacted by IT vendors or digital platformers to get information on digital solutions. A very small percentage claimed to be knowledgeable as a result of government training (Figure C. 9). Only five percent (Figure C. 10), a large majority of which are registered business, reported receiving government assistance to increase their digitalisation, primarily in the form of tax exemptions/reductions and training/education. However, support in the form of consultation and partner matching for MSMES is uncommon, which could explain the lack of access to experts with experience in advanced digital technology. The majority of those who have not received government assistance cite a lack of awareness as the primary reason (Figure C. 15). In addition, the survey revealed that the assistance that MSMEs require most from the government in order to increase digitalisation is related to enhancing the skills of their employees and tax reduction or exemption. However, there is a minority of MSMEs that do

not require government assistance, the majority of which are at the fundamental level of digital adoption.

Figure 22: Government support for digitalisation

Awareness of government support

7.60% 1%
19%
72%

- Unfamiliar
- Limited awareness
- Moderate awareness
- Good awareness

Access to government support

5%

Type of support received

Subsidies/tax exemption	60%
Training and education	32%
Consultant	20%
Partner matching	10%
Tools/equipment	4%

Type of support needed

Employment support,…	39%
Taxs (cut, waive)	29%
No need	24%
Support in equipment…	19%
Digital platform for the…	19%
Expert support and…	19%
Loan guarantees	12%
Grants and subsidies	9%
Loan without interest	6%

5. DIGITAL TECHNOLOGY ADOPTION AND FIRM PERFORMANCE

The conceptual and empirical literature points to mounting evidence that digital technology not only fosters a competitive environment for the domestic economy but also acts as a dynamic conduit to boost domestic industry's competitiveness and increase social and economic benefits. Digitalisation can expand customer reach, improve organisational flexibility and resilience, and generate profitability for businesses (ERIA 2019; Von Briel, Davidsson, and Recker 2017). The COVID-19 epidemic, which severely restricted physical contact and therefore disrupted the transportation of products, services, and people, demonstrates how

crucial digitalisation is for businesses to withstand shock. We have seen a growing number of firms turning to digital platforms for sales, marking an unprecedented shift toward the digital business model (UNCTAD 2020). Additionally, there is anecdotal evidence that suggests businesses that have a higher level of digitisation are more robust and perform better during COVID-19 outbreaks (Guo et al. 2020). In this section, we conduct an empirical analysis of the impact of digital technology adoption on business performance among MSMEs operating in the Cambodian tourism industry.

5.1. Econometric specification

This section elaborates on econometric specification to estimate the effect of DT adoption on MSMEs' performance. In particular, we adopt the firm heterogeneity model, which states that a firm's performance depends on its use of digital technology and other firm characteristics. The causal relationship between DT adoption and firm performance can be expressed as follows:

$$Perform_{is} = \alpha_0 + \beta_1 digital_{is} + \beta_2 X_{is} + d_l + d_s + \varepsilon_{is} \qquad (1)$$

Where subscript i denotes firm and s is sector. $Perform_{is}$ denotes the firm performance while $digital_{is}$ refers to DT adoption. In our model, X_{is} is a vector of firm characteristics that collectively affect firm performance. To control for the unobserved factors that may affect firm performance across different sectors and locations, our econometric specification also includes sector-fixed effect d_s and location-fixed effect d_l.

Dependent variables:

We used two different variables to measure the performance of MSMEs in the tourism sector during the COVID-19 outbreak.

- *Revenues (rev_{is}):* our first dependent variable is revenues. In our questionnaire, we ask the sample firms to report annual revenues in 2021. Since revenues are continuous data, we log-transform this variable to remove skewness. We hypothesize that businesses who invest more in digital technology will not only increase their operational revenues - because the adoption of digital technology aids in the expansion of the consumer base through digital platforms - but also reduce cost via more operation efficiency.

- *Productivity ($prodt_{is}$):* Productivity is the second outcome associated with digital technology. We follow several seminal works including Amiti and Konings (2007); Amiti and Wei (2009); and Görg, Hanley and Strobl (2008) by using the log of sales per worker as a proxy for labour productivity. We expect a positive relationship between digital technology and labour productivity in our assessment because conceptually, digitalisation helps businesses streamline operations and boost efficiency.

Independent variables:

- *Digital technology adoption:* since digital technologies are multi-dimensional and include everything from electronic tools and technological devices to systems and

resources, we apply a number of variables to measure adoption. The first metric is DT investment (dig_invest_{is}), which is the total annual spending on digital platforms, software, hardware, and other technologies including the internet, digital marketing, and clouding. As a result of COVID-19, almost 53 percent of the MSMEs in our sample have made investments in new technologies or digital solutions, with an average investment of roughly USD 1,814 per year. Businesses that invest more in DT are considered to have a greater DT adoption rate, and as a result, they can anticipate better performance in terms of revenue and productivity. Second, we gauge DT adoption by averaging the results of 10 digital-related questions with dichotomous ("yes"/ "no") replies. Those questions are: 1) do you have technological devices for business operations? 2) does your establishment use Microsoft Office software? 3) does your establishment have a website? 4) does your establishment have a social media account for business operations? 5) does your establishment use a digital platform? 6) does your enterprise accept e-payment? 7) does your establishment use advanced software for accounting and financial management? 8) does your establishment use advanced digital technology for customer relationship management? 9) does your establishment use technology for communication and marketing? and 10) does your establishment use advanced tools for data analytics? The maximum scale is 10, with 0 being the lowest. A greater average number indicates a higher level of acceptance of digital technology. Our hypothesis is that MSMEs will perform better in terms of revenue and productivity if they embrace higher DT.

- *Firm characteristics:* as in most firm-level analysis and firm performance studies, we control a set of firm characteristics including age, size, ownership structure, access to finance, training and skill intensity. These factors can all affect firm performance. Age (age_{is}) refers to the number of years in operation. We proxy firm size ($size_{is}$) by the total number of employees and hypothesize that size has a positive and significant association with firm performance. In other words, a larger company will create more income. Foreign ownership (for_own_{is}) variable takes value 1 if the establishment is foreign-owned and 0 otherwise. We define foreign-owned firms as those for which foreign individuals, companies, or organizations own 10 percent or more of their capital stake. We define firms with better access to finance (acc_fin_{is}) as those that have a credit line/loan from a financial institution. We capture skill intensity by the firm's training program for employees. Finally, we control the quality of human resources within the firm, which is proxied by skill intensity and the training program. Skill intensity ($skill_{is}$) refers to the proportion of skilled employees to the total employees. In the questionnaire, we ask the firm to disclose the number of staff with a particular level of education. Skilled employees are defined as those with education attainment at a diploma certificate or higher. The variable ($training_{is}$) takes the value 1 if a firm provides formal training to its employees and 0 otherwise. Like most firm heterogeneity empirics, it is anticipated that foreign ownership, access to finance and human capital have a significant and positive relationship with firm performance.

The final estimation equation is given as:

$$ln\_rev_{is} = \alpha_0 + \beta_1 dig\_invest_{is} + \beta_2 age_{is} + \beta_3 ln\_size_{is} + \beta_4 for\_own_{is} + \beta_5 acc\_fin_{ist} +$$
$$\beta_6 skill_{is} + \beta_7 training_{is} + d_l + d_s + \varepsilon_{ist} \qquad (2)$$

The primary source of data for our empirical analysis is the survey of 1,000 MSMEs in the tourism sector in Cambodia. An extensive range of data was collected throughout the survey, which involved 11 different types of tourism-related firms, including fundamental business data, sales, and coping strategies for the COVID-19 shock, as well as information on employment and skill levels, financial access, adoption of digital technologies, and government policy involvement. After eliminating observations with missing data for any variable, 894 observations are left for estimation. Table 3 displays summary statistics.

Table 3: Summary statistics

Variable	Observation	Mean	Std. Dev.	Min	Max
Sales (in USD)	988	29946.9	108736.1	0	1902485
Age (in year)	988	6.772	6.367	1	42
Foreign ownership	988	0.071	0.257	0	1
Access to finance	988	0.262	0.440	0	1
Training	988	0.259	0.438	0	1
Skill intensity	988	0.149	0.260	0	1
Digital investment (in USD)	988	1827.8	6923.5	15	100750
Basic DT	988	0.621	0.485	0	1
Intermediate DT	988	0.286	0.452	0	1
Advanced DT	988	0.092	0.289	0	1

5.2. Estimation strategy

Ordinary least squares (OLS) regression is used as the baseline estimation when estimating equation (2). We control sector and location-fixed effects in our estimation to take into account variances across industries and locales. We re-estimate equation (2) with different digital technology measurements based on the three stages of adoption - basic, intermediate, and advanced level - in order to demonstrate the reliability of our baseline results. Estimation is conducted separately for each dependent variable.

5.3. Empirical findings

5.3.1. *The impact of digital technology adoption on a firm's revenue*

Table 4 shows the baseline results about the effect of digital technology adoption on firm performance in terms of revenue. Robust standard errors are reported in parentheses below each coefficient while the degree of statistical significance is indicated by the number of stars. A low incidence of multicollinearity among independent variables in the econometric specification warrants the need for robust regression estimation. By running a correlation matrix among the independent variables, we may determine if our regression has a multicollinearity issue. We also detect multicollinearity using variance inflation factor (VIF) method. Since there was little correlation between the right-hand side variables (correlation

coefficients for all variables are well below 0.5) and the value of VIF for each independent variable was less than 4 (the most commonly used threshold value), we concluded that our regression was not affected by multicollinearity. It is important to note that we ran a series of regression diagnostics to determine how well our data met the OLS regression assumptions. We began by examining the normality of residuals[6]. The results indicated a slight deviation from the normal distribution, so we argued that the residuals were close to a normal distribution. We then tested for heteroscedasticity[7] to determine whether our model was well-fitted. With the p-values of most tests being extremely small, we argued that the residual variance is not homogeneous. Finally, we conducted a regression specification error test[8] (RESET) for omitted variables. The results of our test suggested that our regression models were properly specified.

Before going into detail about how digital technology affects revenue, we first discuss the results for other firm-level characteristics. With the exception of age and foreign ownership, every coefficient has the expected sign, is statistically significant, and the results are reliable across a range of specifications, demonstrating the robustness of the estimates. The size coefficients are all statistically significant and positive, indicating that larger MSMEs are more likely to produce higher revenue levels. The results highlight how crucial economic scale is to maximising business operations. The coefficients age is positive but statistically insignificant, indicating that the sample MSMEs' number of years of operation has no bearing on revenue generation. Contrary to the majority of firm-level studies, which frequently concluded that foreign ownership is essential to firm performance, the findings from our sample firms are the exact opposite. The difference in annual revenue between MSMEs owned by foreigners and MSMEs owned by Cambodians is negligible. One possible explanation for this result is that firms in the manufacturing sector which are foreign-owned often have superior technology and well-established foreign business networks that contribute differently to revenue than domestic firms; however, these advantages are not as significant in the tourism sector.

Revenue and financial access are positively correlated, and the findings hold up under various assumptions. This suggests that business loans are critical for growing enterprises to raise revenue. In other words, MSMEs with access to bank loans generate more revenue than those without it. Revenue generation has been found to positively correlate with staff training. MSMEs that offer a formal training programme to their employees outperform their competitors. The estimated skill intensity coefficient is positive but not statistically significant.

The results for DT adoption vary depending on measures. Column 1 of Table 4 contains the baseline estimate for DT investment. It has been found that investing in digital platforms, hardware, and software are essential for growing sales. To be more precise, a 10 percent increase in investment in digital technology could result in a 0.8 percentage point increase in revenue. As a result of the COVID-19 shock, 23 percent of the MSMEs in our sample have shifted to online sales. In light of this trend, we investigate further the multiplicative effects on

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[6] After running the regression, the '*predict*' command is used to generate residuals, followed by the '*pnorm*' command to generate a standardised normal probability.

[7] After conducting a regression analysis, the '*estat httest*' command is executed.

[8] The STATA command for this test is 'ovtest'.

revenue generation of investing in digital technology and shifting to an online business model. We introduce interactive terms between investments in digital technology and switching to the online environment and re-estimate the equation to capture this concurrent effect. As can be seen in Column 2 of Table 4, the coefficient of interactive terms is significant and positive, indicating that switching to an online mode of coping and investing in digital technology resulted in increased performance for MSMEs during the COVID-19 pandemic. We tested the training variable against the DT investment variable to determine whether MSMEs that offer training to their employees benefitted more from DT investment. It was found that MSMEs would further benefit if they invested in both digital technology and training, as shown in Column 3 of Table 4, where the coefficient of an interactive term is positive and significant.

Table 4: Estimation results for digital technology adoption and revenue

Annual revenue	(1)	(2)	(3)	(4)	(5)
Firm size	0.254***	0.284***	0.315***	0.307***	0.299***
	(0.0755)	(0.0746)	(0.0731)	(0.0839)	(0.0775)
Age	0.0363	0.0323	0.0242	0.0123	0.0134
	(0.0586)	(0.0588)	(0.0585)	(0.0618)	(0.0612)
Foreign ownership	-0.251	-0.313	-0.314	-0.288	-0.324
	(0.270)	(0.270)	(0.264)	(0.273)	(0.274)
Access to finance	0.374***	0.413***	0.405***	0.418***	0.437***
	(0.105)	(0.106)	(0.106)	(0.109)	(0.108)
Training	0.246*	0.285**		0.320**	
	(0.138)	(0.140)		(0.141)	
Skill intensity	0.0211	0.0202	0.0206	0.0213	0.0194
	(0.0231)	(0.0237)	(0.0235)	(0.0242)	(0.0237)
DT investment	0.0822***				
	(0.0197)				
DT investment # online		0.0763***			
		(0.0259)			
DT investment # training			0.102***		
			(0.0275)		
DT adoption				0.0444	
				(0.109)	
DT adoption # training					0.259**
					(0.105)
Observations	988	988	988	951	951
R-squared	0.125	0.115	0.117	0.103	0.105
Sector-FE	Yes	Yes	Yes	Yes	Yes
Location-FE	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Columns 4 and 5 of Table 4 provide the estimates using the average score for DT adoption. The adoption of DT has a positive coefficient, but it is not statistically significant; however,

the interaction between DT adoption and training has a statistically significant coefficient (0.259**). The conclusion suggests that only MSMEs that offer employee training will see a positive impact on annual revenue from DT adoption. It emphasises how crucial digital infrastructure and human capital skills are to maximising revenue generation in businesses.

5.3.2. The impact of digital technology adoption on labour productivity

Our next measure for firm performance is labour productivity, which is proxied by total sales per worker. Similar to the previous dependent variable, the estimation includes fixed effects for sector and location, as well as firm characteristics, to account for any unobserved variations that may affect a firm's productivity level. For specifications with labour productivity, we exclude firm size. The estimated results are given in Table 5. Age and financial access have negative but insignificant coefficients, which reflect their negligible effects on a firm's productivity. Foreign ownership, despite a positive coefficient, was also found to have no discernible impact on labour productivity. The majority of specifications have positive and significant training coefficients that show how training programmes have improved productivity. The coefficient for skill intensity is positive but statistically insignificant, indicating that the contribution of workforce skills to productivity enhancement is negligible.

Table 5: Estimation results for digital technology adoption and productivity

Labour productivity	(1)	(2)	(3)	(4)	(5)
Age	0.00843	-0.00268	-0.00386	-0.00132	-0.0123
	(0.0449)	(0.0455)	(0.0450)	(0.0488)	(0.0476)
Foreign ownership	0.118	0.0821	0.0703	0.0756	0.0570
	(0.199)	(0.203)	(0.197)	(0.200)	(0.202)
Access to finance	-0.0427	-0.0285	-0.0271	-0.0216	-0.0107
	(0.0791)	(0.0791)	(0.0794)	(0.0818)	(0.0819)
Training	0.181*	0.209**		0.189**	
	(0.0925)	(0.0954)		(0.0941)	
Skill intensity	0.0212	0.0211	0.0214	0.0196	0.0193
	(0.0149)	(0.0157)	(0.0152)	(0.0159)	(0.0158)
DT investment	0.0522***				
	(0.0131)				
DT investment # online		0.0289*			
		(0.0165)			
DT investment # training			0.0619***		
			(0.0170)		
DT adoption				0.167**	
				(0.0821)	
DT adoption # training					0.201***
					(0.0725)
Observations	760	760	760	725	725
R-squared	0.143	0.128	0.134	0.135	0.134
Sector-FE	Yes	Yes	Yes	Yes	Yes
Location-FE	Yes	Yes	Yes	Yes	Yes

Robust standard errors in parentheses

*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Numerous forms of digital technology have been found to increase productivity. First of all, our findings (Column 1 of Table 5) suggest that in order to increase productivity, MSMEs should invest in hardware, software, cloud computing, networks, and digital platforms. The outcome also highlights the significance of adjusting business strategy during the pandemic to focus on online sales in addition to digital investment. Businesses that invest more in digital technology and switch to online sales are significantly more productive than their competitors. We also include an interactive term between DT investment and training (Column 3 of Table 5), and the result suggests that MSMEs with employee training programmes will see relatively larger productivity gains from DT investment.

Secondly, labour productivity is positively correlated with DT adoption, indicating productivity gains from digital technology. To put it another way, MSMEs with more DT adoption have a tendency to be more productive. For MSMEs in the tourism sector, having websites, using social media and networks more frequently, being more active on digital platforms, and using e-payment methods are critical in order to optimise operations, improve communication, and reach wider customer bases. All of these factors help to increase efficiency and productivity.

5.4. Differentiating the impacts of digital technology adoption

5.4.1. *Differential impact of various stages of DT adoption*

This section investigates how the effects of adopting digital technology vary across MSMEs at various stages of adoption. Following ERIA (2019), we classify DT adoption into three levels: basic, intermediate and advanced. Based on the answers to 10 dichotomous ("yes"/"no") questions (refer to section 5.1), a measure is constructed for each state of DT adoption. The responses give a minimum scale of 0, a maximum scale of 10 and an average value of 3.28. MSMEs in the early stages of DT adoption are those with scores below the sample average of 3.28. MSMEs who scored higher than the mean of 3.28 but lower than or equal to 6 are in the middle stages of DT adoption. A score of more than 6 indicates that MSMEs are in an advanced stage. According to the classification, the proportion of businesses at various stages of digitalisation is as follows: 62 percent of MSMEs in the tourism sector are at the basic stage, 28.7 percent are at the intermediate stage, and 9.3 percent are at the advanced stage. We introduce and estimate each DT adoption stage separately in equation (2) in order to avoid an unnecessary multicollinearity issue in our specification.

The results of DT adoption on revenue are given in Columns (1), (2) and (3) of Table 6. According to the estimate, basic DT adoption has a negligible effect on revenue, indicating that owning technological tools and using basic software like Microsoft Office was insufficient to positively impact revenue during the pandemic. What matters, however, is a higher level of digitalisation in terms of having a website, greater use of social media and networks, more activity in digital platforms, and the use of e-payment methods. This result is demonstrated by a positive and significant coefficient of intermediate-stage DT adoption, which can be

interpreted as indicating that MSMEs perform better than their counterparts at this stage of adoption. The coefficient becomes negative but insignificant for advanced stages of digital technology adoption. This means that the use of various cutting-edge software, such as in accounting, customer relationship management, communication and marketing, and data analytics, may not be very pertinent for MSMEs in the tourism sector to boost their revenue.

For productivity regression, the outcomes are comparable. Particularly, intermediate but not basic DT adoption is positively correlated with labour productivity. This suggests that increasing productivity among MSMEs in the tourism industry specifically calls for more than just technological tools and fundamental software; it also calls for a digital transformation that includes having a website, utilising social media and networks more frequently, being more active on digital platforms, and using e-payment methods. We can contend that the pandemic illustrated how important digitalisation is to help MSMEs increase productivity. The coefficient becomes negative but insignificant for advanced stages of digital technology adoption. This indicates that there is no proof that MSMEs in the tourism sector have become more productive as a result of using cutting-edge accounting, customer relationship management, and data analytics tools and software.

Table 6: Estimation results for different stage of DT adoption

	Annual revenue			Labour productivity		
	(1)	(2)	(3)	(4)	(5)	(6)
Firm size	0.402***	0.389***	0.336***	-	-	-
	(0.0833)	(0.0818)	(0.0745)			
Age	-0.0134	-0.00585	0.00909	0.0814	0.0828	0.111
	(0.0595)	(0.0597)	(0.0584)	(0.200)	(0.201)	(0.202)
Foreign ownership	-0.336	-0.350	-0.278	-0.0369	-0.0431	-0.0489
	(0.300)	(0.296)	(0.272)	(0.0796)	(0.0795)	(0.0801)
Access to finance	0.322***	0.316***	0.384***	0.212**	0.216**	0.242**
	(0.108)	(0.108)	(0.106)	(0.0955)	(0.0952)	(0.0947)
Training	0.359**	0.356**	0.346**	0.0201	0.0220	0.0239
	(0.146)	(0.145)	(0.140)	(0.0160)	(0.0166)	(0.0176)
Skill intensity	0.0167	0.0199	0.0245	-0.0059	-0.0051	-0.0144
	(0.0266)	(0.0264)	(0.0242)	(0.0455)	(0.0455)	(0.0453)
Basic DT adoption	-0.0899			-0.124		
	(0.140)			(0.0967)		
Intermediate DT adoption		0.231*			0.158*	
		(0.142)			(0.0942)	
Advanced DT adoption			-0.158			-0.163
			(0.271)			(0.191)
Observations	894	894	988	760	760	760
R-squared	0.136	0.139	0.104	0.126	0.128	0.126
Sector-FE	Yes	Yes	Yes	Yes	Yes	Yes
Location-FE	Yes	Yes	Yes	Yes	Yes	Yes

5.4.2. Comparing productivity gains and resilience to shock

To compare the productivity gains from DT adoption between firms at the basic stage of DT adoption and those at the intermediate stage, we refine our baseline specification in addition to those that allow us to differentiate between the impact of different stages of DT adoption. In the equation, a new variable for digital adoption is introduced. The variable is a dummy that, specifically, takes on the value 1 for firms at the intermediate stage of DT adoption and the value 0 for firms at the basic stage of DT adoption. There are two reasons why we compare productivity gains between these two categories of businesses. The majority of MSMEs adopt DT by owning digital devices and connecting to the internet, as we can see from the analysis that came before it. However, this level of digitalisation hasn't been shown to significantly enhance business performance. Second, we discovered that companies that use a business model that incorporates a website, digital platform, social media, and electronic payment (at the intermediate stage of DT adoption) perform better, particularly in terms of productivity. This forces us to consider how much the gains differ and whether the marginal gains justify moving MSMEs from the basic to the intermediate stage of DT adoption. Column (1) in Table 7. illustrates the outcome of productivity gains from the adoption of intermediate DT. It is obvious that MSMEs at the intermediate stage of DT adoption have a 16 percentage point higher productivity level than those at the basic stage.

Table 7: Estimation results for basic stage versus intermediate stage of DT adoption

	(1) Productivity	(2) Resilience
DT adoption (1=intermediate stage; 0=basic stage)	0.157*	0.277
	(0.100)	(0.234)
Observations	703	519
R-squared	0.132	0.1079
Sector-FE	Yes	Yes
Location-FE	Yes	Yes

Along with productivity gains, we contrast the COVID-19 shock resistance of firms with basic DT adoption and firms with intermediate DT adoption. According to this specification, firms' resilience to shock is a dependent variable with a value of 1 if their revenues are staying the same or rising in comparison to the year before COVID-19, and a value of 0 otherwise. A probit estimator is used to estimate this econometric specification. As can be seen in Column (2) of Table 7, businesses with intermediate levels of digitalisation are not more resistant to COVID-19 shock than those with the lower level of digitalisation. Findings indicate that the tourism industry has been severely impacted by the COVID-19 pandemic and that digitalisation is insufficient to mitigate the pandemic's negative effects.

5.4.3. Differential impact of DT adoption across sectors

The impact of adopting digital technology is evaluated in this section in terms of how it varies across industries. We estimate equation (2) separately for the two aggregate sectors of accommodation and restaurant and food business in order to obtain differentiated impacts. Due to insufficient data, we exclude entertainment, transportation, and tour operators from our analysis. Table 8 presents the estimation results.

Sectoral estimation can be used to make a few observations. First and foremost, investment in digital technology is the key factor favourably affecting firm performance for both the accommodation and restaurant and food industries. The difference, however, is that MSMEs in the accommodation industry experience a relatively higher revenue gain from DT investment than those in the restaurant and food industry, as evidenced by a larger positive coefficient of the DT investment variable in estimation for the accommodation industry as compared to the restaurant and food industries. The adoption of DT appears to have no impact on revenue for either sector, as in the initial estimation. Second, positive and significant coefficients demonstrate the productivity gains from DT adoption and investment in the hospitality and food industries, respectively. Compared to their counterparts in the restaurant and food industries, MSMEs in the lodging industry seem to gain more from digital technology.

Table 8: Estimation results for revenue and productivity by sector

	Annual revenue		Labour productivity	
	(1)	(2)	(3)	(4)
	Accommodation	Restaurant and food business	Accommodation	Restaurant and food business
DT investment	0.134***	0.0757***	0.118***	0.0507***
	(0.0438)	(0.0231)	(0.0345)	(0.0144)
DT adoption	0.387[a)]	0.0294	0.554**	0.189**
	(0.318)	(0.122)	(0.244)	(0.0926)
Observations	208	703	142	533
Location-FE	Yes	Yes	Yes	Yes

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

5.4.4. Differential impact of female leadership on revenue and productivity

This section extends the baseline estimation by adding the gender of the general manager in the regression to explore the role of women's leadership in firm performance. We construct a dummy variable taking value 1 if the general manager is female and 0 otherwise and then estimate the regression separately for revenue and productivity. About 52 percent of the sample enterprises are managed by women. According to Table 9, the effect of female leadership on both revenue and productivity is insignificant. With the gender variable included in the estimation, the results for DT investment and DT adoption do not differ from the initial findings, indicating the estimation's robustness.

Table 9: Estimation results for female leadership

	(1) Revenue	(2) Revenue	(3) Productivity	(4) Productivity
Female manager	-0.133	-0.184	-0.0238	-0.0160
	(0.112)	(0.117)	(0.0800)	(0.0820)
DT investment	0.0808***		0.0519***	
	(0.0197)		(0.0132)	
Intermediate DT adoption		0.225*		0.159*
		(0.141)		(0.101)
Female manager	-0.133	-0.184	-0.0238	-0.0160
	(0.112)	(0.117)	(0.0800)	(0.0820)
Observations	988	894	760	718
R-squared	0.126	0.141	0.143	0.127
Sector-FE	Yes	Yes	Yes	Yes
Location-FE	Yes	Yes	Yes	Yes

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

5.4.5.   Differential impact of DT by firm size

This section further explores the extent to which the impact of DT on revenue and productivity varies by firm size. To obtain the differentiated effects, we estimated equation (2) separately for micro firms, and small and medium-sized firms[9]. The estimation results presented in Table 10 indicate that DT investment has a positive and statistically significant impact on the performance of all enterprise sizes. However, the revenue and productivity gains from DT investment are greater for small and medium-sized businesses compared to micro firms, as indicated by coefficients with greater values. Specifically, a 10 percent increase in DT investment could result in revenue growth of 0.6 percent for micro firms and 0.9 percent for small and medium-sized businesses. Similarly, a 10 percent increase in DT investment increases productivity by 0.56 percent for micro firms and 0.62 percent for small and medium-sized businesses.

Table 10: Estimation results for micro enterprises versus small and medium enterprises

VARIABLES	(1) Revenue	(2) Revenue	(3) Productivity	(4) Productivity
	Micro	Small & Medium	Micro	Small & Medium
DT investment	0.0637**	0.0937***	0.0567***	0.0621***
	(0.0256)	(0.0281)	(0.0198)	(0.0174)

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[9] The number of observations for medium-sized enterprises is insufficient for estimation, so small and medium-sized enterprises are grouped together.

Observations	497	491	428	332
R-squared	0.169	0.095	0.219	0.185
Sector-FE	Yes	Yes	Yes	Yes
Location-FE	Yes	Yes	Yes	Yes

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

6. CONCLUSION AND POLICY SUGGESTIONS

6.1. Concluding remarks

This study uses firm-level survey data from MSMEs in Cambodia's tourism industry to examine the adoption of DT and empirically evaluate its effects on firm performance. The paper also explores how digitisation can reduce the risk of COVID-19 shock and increase future resiliency if such a situation should arise again.

The results suggest that 60 percent of MSMEs are digitised at the basic level, 30 percent are at the intermediate level, and 10 percent are at the advanced level. Using social media, primarily Facebook, Telegram, and Instagram, for sales and marketing, as well as e-payment methods, is more prevalent than using a website and sophisticated tools for back-end operations.

In adopting digital technology, MSMEs encounter numerous obstacles. Lack of digital skills is the most frequently perceived barrier, followed by a lack of budget and concerns regarding the return on digital investments. Government support for digitalisation is unknown to or poorly understood by the vast majority of MSMEs. As a result, only five percent of survey participants reported receiving government assistance, primarily in the form of tax exemptions/reductions and training/education. The results also suggests that very little assistance is provided in the form of consultation and partner matching.

Our empirical findings are largely consistent with previous research. We find evidence that DT adoption is essential for MSMEs to increase revenue. Businesses that transition to online sales and marketing and offer employee training reap greater rewards from DT investment. The basic stage of DT adoption has been found to be insufficient for increasing revenue, but the intermediate stage, which is determined by a higher level of digitalisation in terms of websites, e-commerce, social media, and e-payment, is crucial for increasing revenue. For MSMEs in the hospitality industry, as compared to MSMEs in the restaurant and food business, the benefits of DT adoption are greater.

Additionally, we found evidence that DT adoption positively relates to productivity. In particular, MSMEs that adopt DT more frequently tend to be more productive. Gains differ depending on the industry and stage of DT adoption. Particularly, MSMEs in the hospitality industry benefit more from DT adoption than MSMEs in the restaurant and food industry. MSMEs with DT implementation in the intermediate stage have a 16 percentage point greater productivity level than MSMEs with DT adoption in the basic stage.

Regarding the relationship between DT adoption and resilience, MSMEs with intermediate levels of digitalisation were more resilient to the COVID-19 shock than those with the lowest levels of digitalisation. This conclusion highlights the significance of digital transformation in reducing the COVID-19 pandemic's detrimental effects. Additionally, we discover evidence that supports the idea that firm heterogeneity is crucial for improving performance. Revenue and productivity are positively correlated with factors including availability of financing, training, and skill intensity.

The significance of digital technology as a crucial element in business performance and resilience to the COVID-19 shock is highlighted by this study. The potential benefits heavily depend not only on the availability and use of technological tools and fundamental software, but also—and perhaps more importantly—on a greater inclination towards using websites, social media, digital platforms, and e-payment methods.

6.2. Policy suggestions

MSMEs in the tourism industry in Cambodia are already utilising digital technologies, but the majority of them are still in the early stages of DT adoption. This prevents businesses from fully utilising the benefits of digital transformation, such as reducing the detrimental impacts resulting from the COVID-19 pandemic. Businesses, including MSMEs, need to embrace digitalisation to thrive as DT has advanced quickly and increased in the global economy. A two-pronged strategy of interventions that encourage MSMEs to benefit from digitalisation while overcoming the obstacles is necessary to encourage the wider adoption of DT. In fact, this policy direction is outlined as one of the strategic measures in the Roadmap for Recovery of Cambodia Tourism During and After COVID-19. Policies to encourage the adoption of DT by MSMEs should concentrate on the following six areas of policy action:

a) Promote ICT and other digital infrastructure

ICT and other digital infrastructure must be improved for digital transformation to take place. Cambodia is lagging behind most of the region in ICT development, despite making impressive strides in expanding the 4G network and utilising mobile technology for both personal and increasing business use (MOC 2020). The significant disparity in connectivity, high-speed internet, and internet access between major cities, provincial cities, and rural areas is also a problem and threatens to increase unequal usage of ICT and e-commerce. National digital policies should therefore concentrate on accelerating the development of high-speed broadband networks and infrastructure as well as addressing digital divides. The policy suggestions in this direction include bolstering and increasing investment in digital and telecommunications infrastructure; promoting universal access to high-speed, high-quality internet at an affordable price; and enhancing penetration and adoption of broadband connections outside of urban areas.

b) Increase knowledge and skills in digitalisation

Businesses require digital capabilities to succeed, yet the majority of the studied MSMEs lack the skilled staff and access to specialised experience in digital technology. Our findings suggest that a key factor in boosting firm productivity is the capacity of domestic human capital. Therefore, it is important for Cambodia to improve the workforce's digital skills and enable greater digital engagement. Given the value of internal training in improving business performance, it is also essential to support and enable MSMEs in educating employees in digital skills or converting existing knowledge to digital knowledge. Micro, women-owned, and unregistered businesses have the highest demand for training in digital skills; therefore, training in digital skills should specifically target these businesses. Moreover, the government ought to integrate science, technology, and entrepreneurship into the primary and secondary school curricula in addition to improving general education, which is a requirement for the development of human capital. By providing online, in-person, and on-site training, the government can help MSMEs' workforce integrate digital solutions into their daily tasks. The focus of training should be on the abilities that MSMEs need to expand their online businesses, with course topics ranging from using digital platforms, Facebook digital marketing, and digital storytelling to digital security. The provision of digital knowledge and advice, particularly in relation to the process of digitisation and how to use digital tools more effectively, is equally crucial.

c) Promote digital literacy

Our findings indicate that the majority of MSMEs have little to no knowledge of digital technology and are also unaware of relevant government policies and support initiatives. Experiences from other nations, such as Australia, highlight the importance of improving business decision-makers' digital education in order to increase digital engagement (Deloitte 2017). Our study's findings underline how important it is to encourage MSMEs' owners to become digitally literate. Activities in this direction include intensifying awareness campaigns on the benefits of digital technologies; helping MSMEs develop their digital investment strategy and raising awareness of government policies and supports related to digital technology. Micro and unregistered businesses are most likely to lack knowledge of digital technology and its benefits; therefore, policies promoting digital literacy should target these business types.

d) Support access to financial services

Our research indicates that the COVID-19 situation makes it difficult for some MSMEs to obtain loans. However, for those who receive financial services, in terms of loan and digital payment tools, it can boost productivity and reduce risks. This emphasises the necessity of enhancing digital payment capabilities, mobile money capabilities, and business loan support. Special consideration should be given to credit guarantees, which make it simpler for MSMEs to access financing, and Micro Finance Institutions (MFIs), which can aid in extending financial outreach through their extensive networks and high level of trust with MSMEs. The government could consider enhancing MSMEs' access to financing in the medium- to long-term by expanding the operation of SME Banks. Promoting the use of digital payments is

equally important for streamlining business operations. The National Bank of Cambodia should work with financial institutions to develop a digital payment system that is inclusive by ensuring that digital payment tools are readily available, reasonably priced, effective, and reliable. The digital payment system in Cambodia has grown quickly in recent years. In order to make it easier for MSMEs to receive public services, it is also crucial to increase the adoption of digital payment in the public sector.

e) *Enhance trust in digital solutions*

Online fraud and hacking incidents put businesses and customers at risk, deterring them from converting to online transactions. Because they lack the resources they require and a fundamental understanding of the rules and best practices for digital security, MSMEs are prime candidates for being victims of digital fraud (Karr, Loh, and Wirjo 2020). To develop the digital and e-commerce ecosystem, which is fundamental to consumer protection, trust and confidence in digital systems must be built. Cohesive cybersecurity and personal privacy strategies are therefore essential. This is supported by a solid legal system, particularly laws governing data privacy and protection, cybercrime, and e-commerce use. It also relies on competent cybersecurity management. Developing pertinent laws, regulations, and a national strategy for cybersecurity are just a few of the policy responses in this direction. Other responses include increasing public awareness of digital fraud and cybersecurity issues, offering training in these areas, and setting up institutional frameworks at the national and sub-national levels to oversee cybersecurity management. Cambodia should also take advantage of regional organisations like the Association of Southeast Asian Nations (ASEAN) and the Regional Comprehensive Economic Partnership (RCEP) to encourage MSMEs to use digital technology and conduct e-commerce more widely. These regional agreements encourage Cambodia to cooperate with other regional parties in order to help MSMEs overcome barriers to using e-commerce and to advance international cooperation on a wider range of issues, such as cross-border data flow, data protection and privacy, cybersecurity, and protection from cyber fraud.

f) *Incentives for MSMEs to uptake digital technology adoption*

In addition to creating a digital and e-commerce ecosystem that encourages the widespread use of DT, MSMEs require incentives to adopt digital technology. Various support programmes are available in Cambodia for MSMEs, including tax incentives (exemption from income taxes for three to five years), funding for workforce up-skilling and reskilling, and financial and non-financial support provided to business owners through Khmer Enterprise (KE). The Ministry of Industry, Science, Technology and Innovation (MISTI) has introduced the national digital information platform for MSMEs, also known as "KhmerSME," in the area of digitalisation. While lacking the financial support to encourage MSMEs to experiment with and learn about technology adoption, this initiative concentrates on giving MSMEs access to a wider range of business information. To encourage MSMEs to adopt digitalisation in their business operations, Cambodia could take inspiration from other nations and expand its existing "SME Go Digital" Program. The offer of a matching grant for the subscription to digital services could be one way to provide support. The scheme should work with digital solution providers,

significant industry partners, and business associations to give MSMEs access to potential business partners and expert advice on a variety of efficient digital solutions. Similar to other previously mentioned policy priorities, the support for the adoption of digital technologies should focus more on micro and unregistered businesses.

6.3.   Limitation and future research

Our research is the first to examine the current stage of DT adoption among MSMEs in the tourism industry and the impact of DT adoption on firm performance. Using a questionnaire designed specifically for DT, our study can not only construct DT indicators by various stages (basic, intermediate, and advanced) but also specify an econometric model that empirically evaluates the impact of DT adoption on firm performance. The study makes an important contribution not only to policymakers but also to academics and development researchers who conduct similar research. Nevertheless, findings in this report are subject to at least two limitations.

First, although the sample enterprises were randomly selected from major tourism destination provinces, the sample size is insufficient to claim that it is representative of all MSMEs in the tourism sector; and therefore, the findings of this study should be interpreted with caution. In addition, the study did not include manufacturing companies. Future research should investigate the stage of DT adoption and the degree to which it affects the performance of manufacturing firms in the context of the widespread adoption of policies to promote Industry 4.0 for manufacturing.

Second, the scope of this study was limited due to a lack of comprehensive qualitative data. Although our research provides some insight into the stage of DT adoption and its impact on firm performance, it lacks exploratory and qualitative analysis of the subject matter. Future research should employ qualitative methods to examine the following issues: What factors motivate businesses to adopt digital technology? What digital skills and digital training content are essential for MSMEs to benefit from digitalisation? What specific digital skills and digital training content do MSMEs require? Why and how do MSMEs use digital technology? What can be done to help MSMEs benefit from government and donor support for digital technology? Investigation of these questions will build on the foundation laid by this report's examination of the important role that adoption of digital technology plays among MSMEs in Cambodia's tourism industry.

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Appendix A: Sample size distribution by size, location and sub-sectors

Table A. 1: Sample size distribution by location and size

Location	Micro	Small	Medium	(#) Total	(%) Total
Phnom Penh	289	350	14	653	65%
Siem Reap	79	39	8	126	13%
Sihanouk Ville	40	39	7	86	9%
Kampot	48	27	1	76	8%
Koh Kong	20	11	0	31	3%
Ratanak Kiri	12	3	0	15	2%
Mundol Kiri	11	2	0	13	1%
Total	499	471	30	1,000	100%

Table A. 2: Sample size distribution by sub-sector and size

Sub-sector	Micro	Small	Medium	(#) Total	(%) Total
Accommodation	82	112	20	214	21%
Restaurant / food businesses	395	302	10	707	71%
Entertainment	4	14	0	18	2%
Travel agency and transportation	18	43	0	61	6%
Total	499	471	30	1,000	100%

Appendix B: MSMEs characteristics and digital adoption

Figure B. 1: Firms' registration status by sub-sector
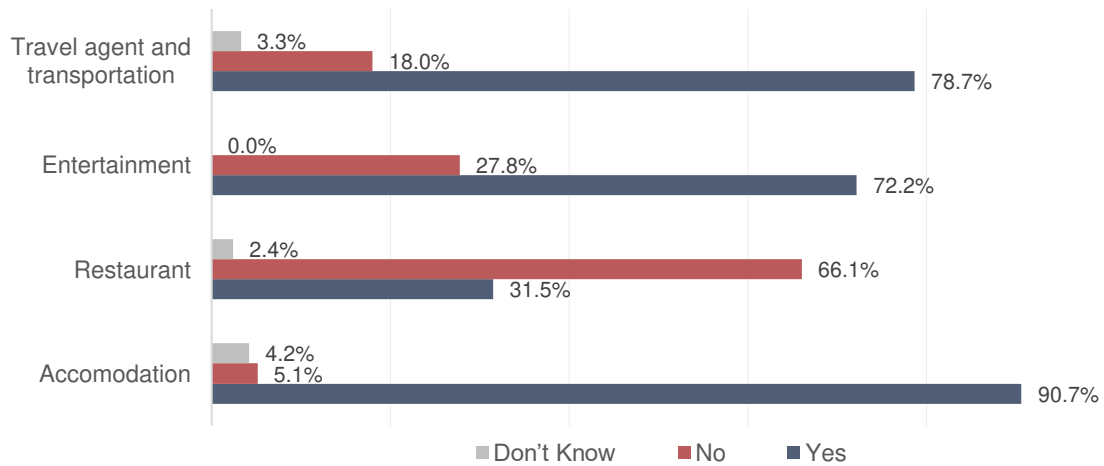

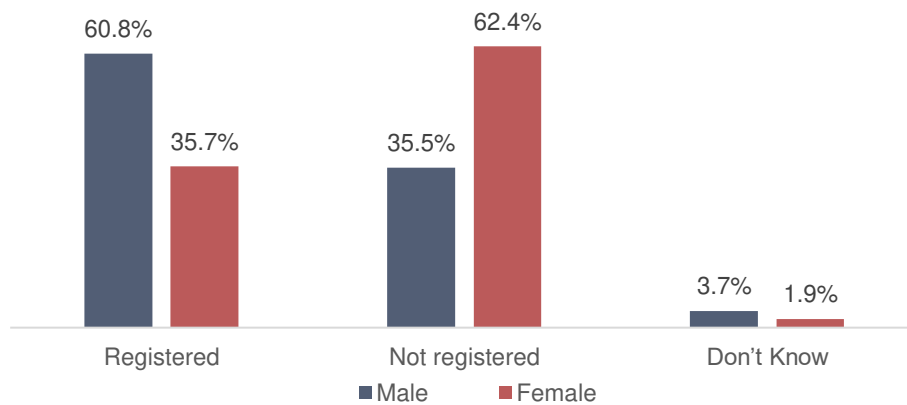*Figure B. 2: Firms' registration status by gender of top manager/owner*

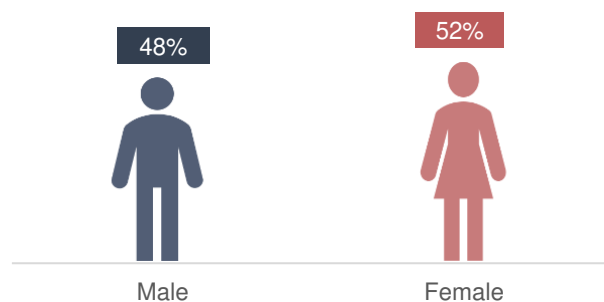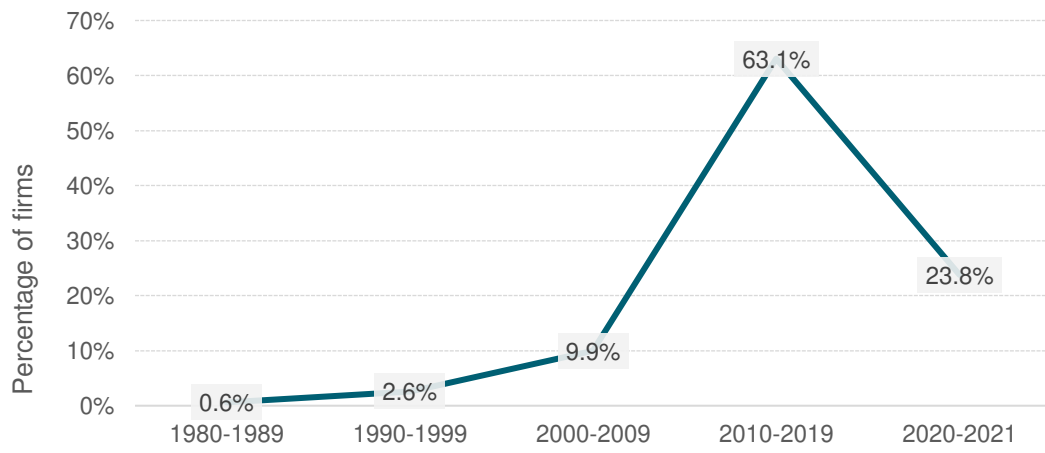*Figure B. 3: Gender of top manager/owner of all surveyed firms*

Figure B. 4: Years of business operation first started

Appendix C: Firms' digital adoption

Figure C. 1: Firms' adoption of digital/e-payment by sector
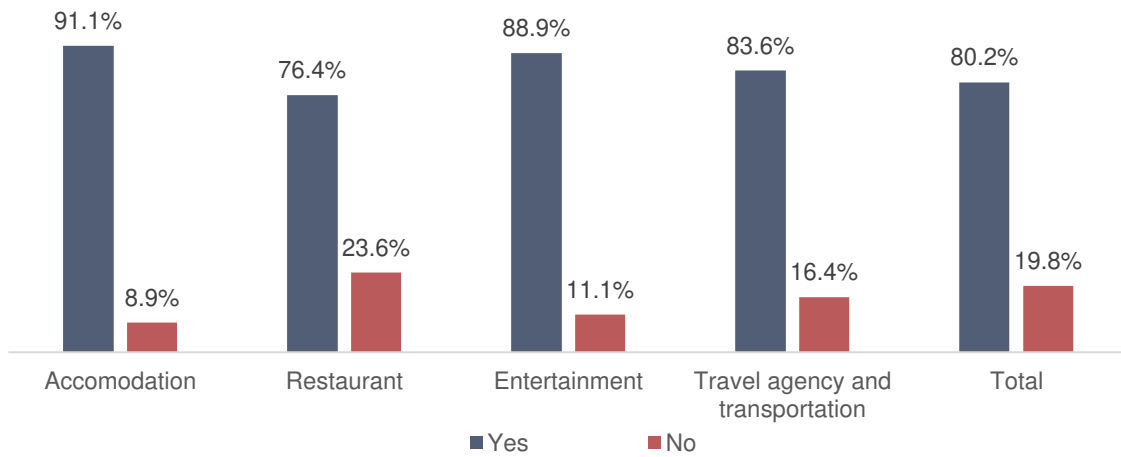

Figure C. 2: The top 10 E-Payment applications adopted by firms
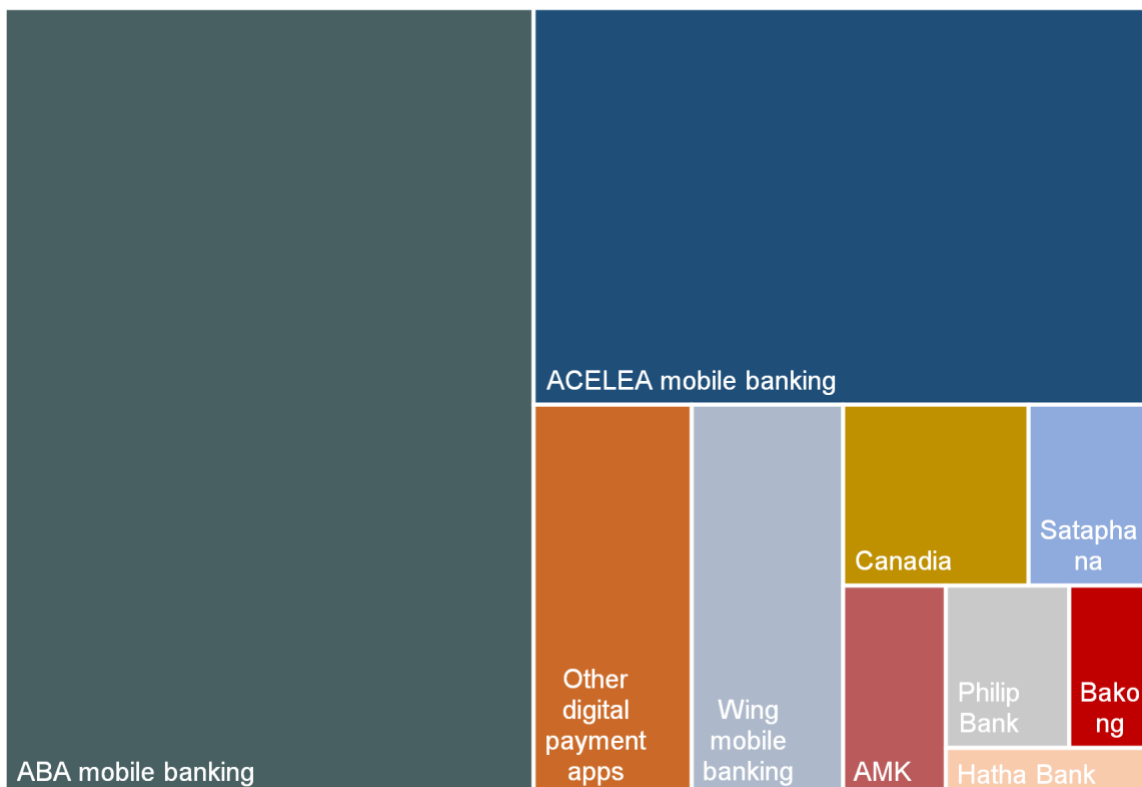
Figure C. 3: Percentage of reported reasons for not investing in new digital technology

Figure C. 4: Average investment on E-commerce/digital platform in 2021 by firms' size
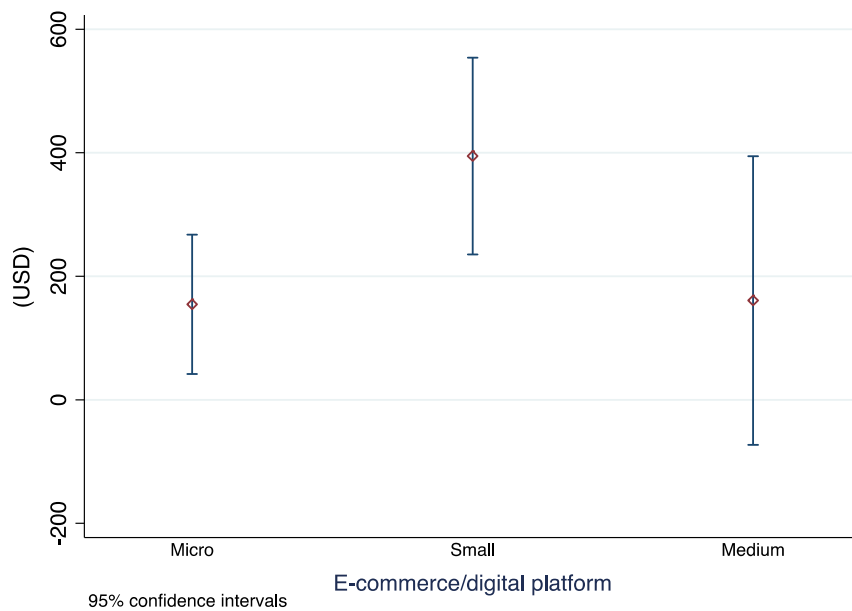
Figure C. 5: Digital adoption by major characteristic

Characteristic	Basic DT	Inter DT	Advanced DT
Registered business			
Yes	29%	70%	94%
No	69%	26%	4.00%
Don't Know	2.30%	4.00%	2.00%
Gender of top manager			
Male	39%	60%	70%

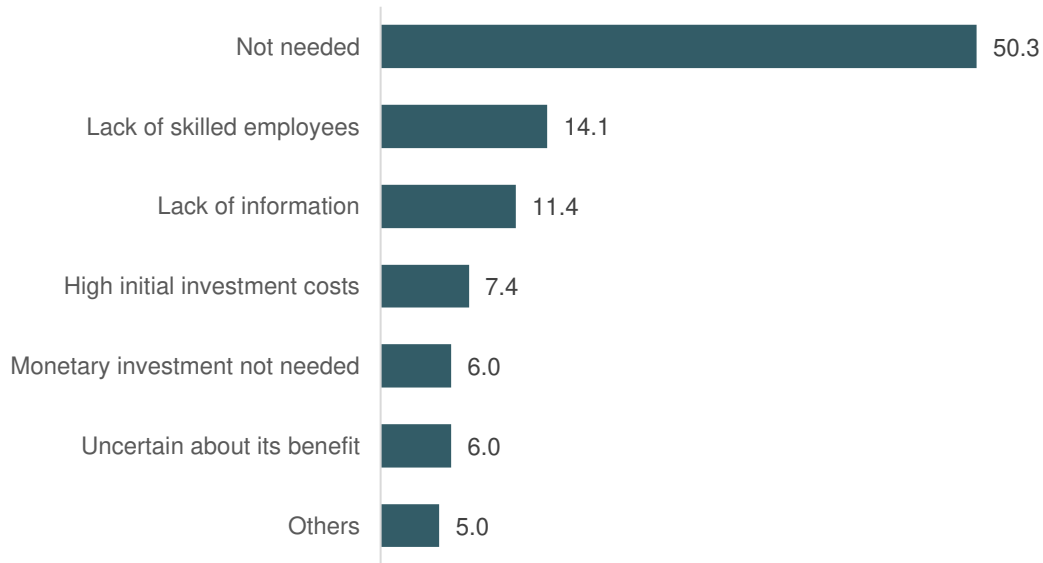|			
Female	61%	40%	30%
Business size			
Micro	69%	28%	4.00%
Small	31%	69%	76%
Medium	0%	3.30%	20%

Figure C. 6: Tools practiced for back-end tasks

- Does not practise accounting and financial management
- Outsource
- Manual (on paper by hands)/Physical
- Basic tools (e.g., Excel, Access)
- Advanced (e.g., accounting/finance software, CRM software, marketing software, data analysis software)
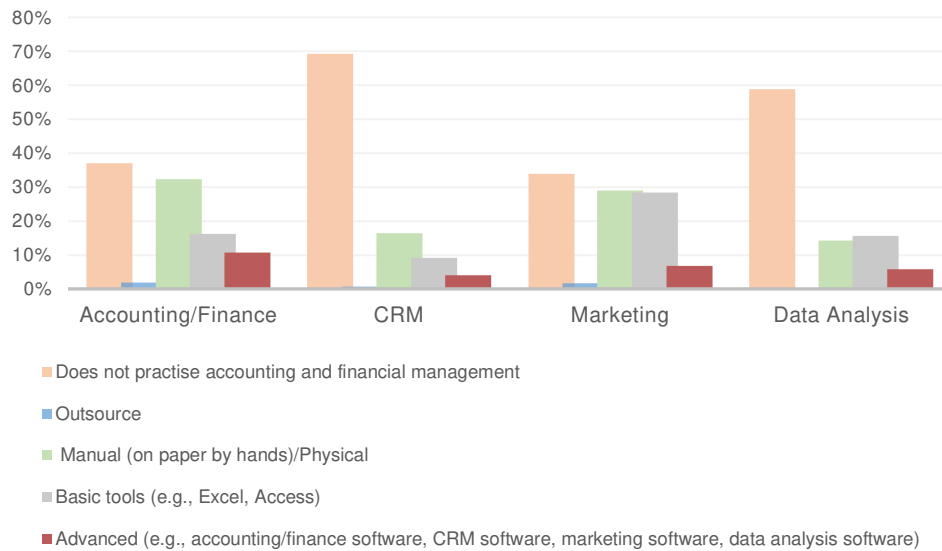
Figure C. 7: Obstacles by level of digital adoption

	Obstacles			
	Basic DT	**Intermediate DT**	**Advanced DT**	**Total**
Lack of skilled personnel	59%	57%	56%	58%
Weak business case / return of investment is not clear	37%	26%	15%	32%
Lack of budget	27%	29%	34%	28%
Absence of industry standard	18%	6%	2%	13%
Lack of access to specialized expertise and advice	9%	16%	13%	12%
Don't have time to learn digital skill	12%	12%	6%	12%
None	8%	15%	20%	11%
Digital infrastructure gaps or limitations	4%	9%	15%	7%
Others	5%	6%	1%	5%
Lack of executive support	1%	7%	5%	3%
Data integrity and cybersecurity concerns	1%	4%	10%	3%
Insufficient government support	1%	3%	4%	2%

Figure C. 8: Benefits by level of digital adoption

	Benefit			
	Basic DT	Intermediate DT	Advanced DT	Total
Better customer services	35%	53%	55%	43%
Lower operating costs	5%	8%	19%	7%
Higher brand awareness	4%	9%	7%	6%
Wider customer reach	25%	48%	45%	34%
Employee empowerment	5%	13%	14%	8%
Profitability	16%	15%	29%	17%
Better marketing	20%	40%	43%	29%
Increased labour productivity	6%	19%	29%	12%
Easy to manage income and expense	19%	36%	40%	27%
No Benefit	13%	1%	0%	8%

Figure C. 9: Source of knowledge on digital technology

Don't get any information 19%
Family/Relatives/ Friends 40%
Different sources (through TV, Radio, social media) 58%
IT Vendor/Digital platformers 26%
Other Training 9%
Government training 2%
Internal recommendation 6%
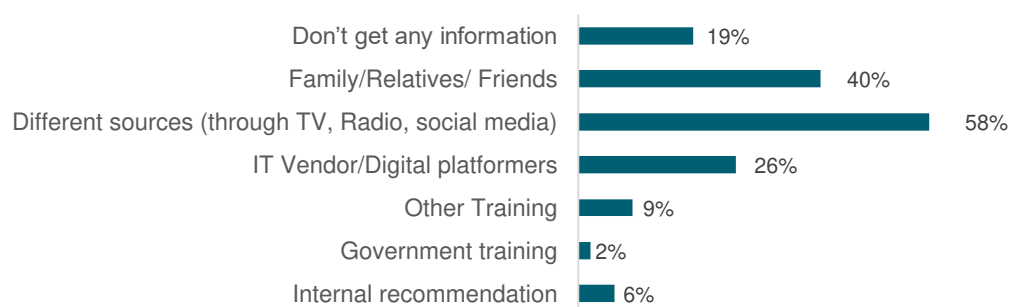
Figure C. 10: Access to government support to increase digitalisation

Characteristic	Received	Did not receive
Registered business		
Yes	88%	46%
No	12%	51%
Don't Know	0%	2.90%
Gender of top manager		
Male	72%	47%
Female	28%	53%

Figure C. 11: Understanding on the term "digital technology"

Pie chart legend:
- Unfamilar
- Limited understanding
- Moderate understanding
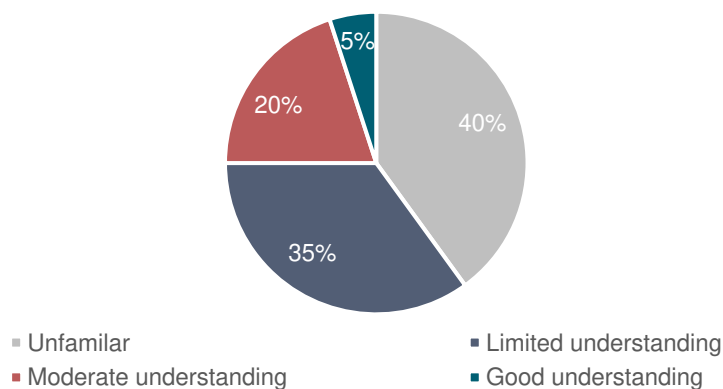- Good understanding

Values: 40%, 35%, 20%, 5%

Figure C. 12: Understanding on digital technology by major characteristics

Characteristic	Unfamiliar	Limited understanding	Moderate understanding	Good understanding
Registration status				
Yes	31%	51%	70%	76%
No	67%	46%	28%	22%
Don't Know	2.30%	3.70%	2.50%	2.00%
Business size				
Micro	71%	44%	26%	18%
Small	29%	54%	66%	69%
Medium	0%	2.00%	8.10%	14%
Gender of top manger				
Male	33%	55%	62%	67%
Female	67%	45%	38%	33%

Figure C. 13: Awareness of government policies and support by firms' size and sub-sectors

Left chart (Micro, Small, Medium) across Unfamiliar, Little understanding, Moderate understanding, Good understanding: 83%, 64%, 33%, 30%, 23%, 33%, 15%, 2%, 12%, 3%, 0%, 1%

Right chart (Accomodation, Restaurant/food business, Entertainment, Travel agency and transportation): 76%, 67%, 66%, 64%, 28%, 26%, 21%, 17%, 7%, 13%, 0%, 6%, 6%, 2%, 1%, 2%
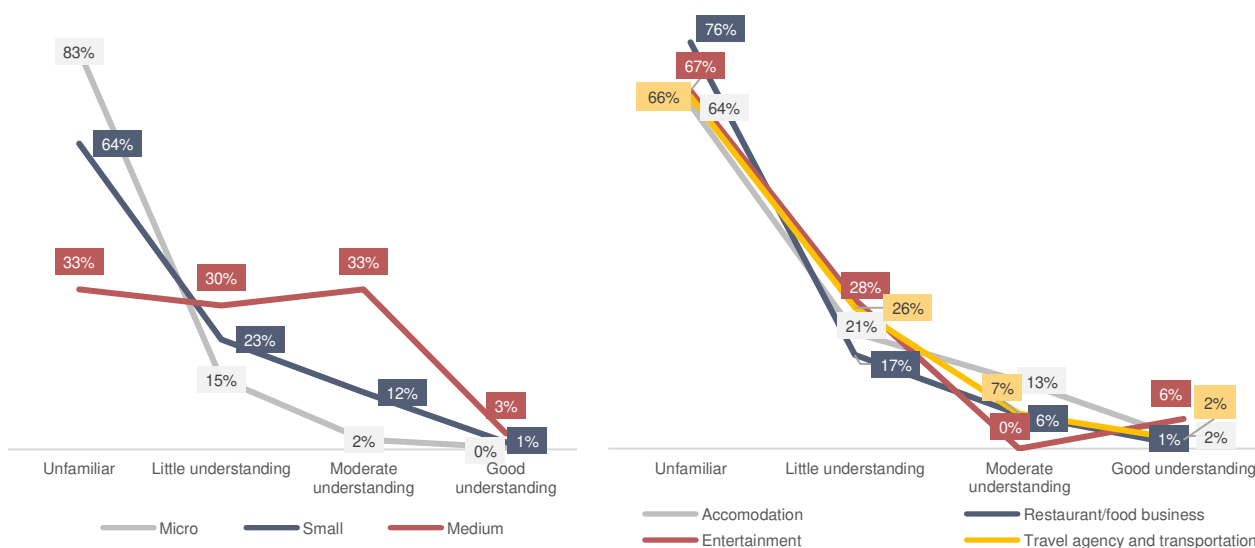
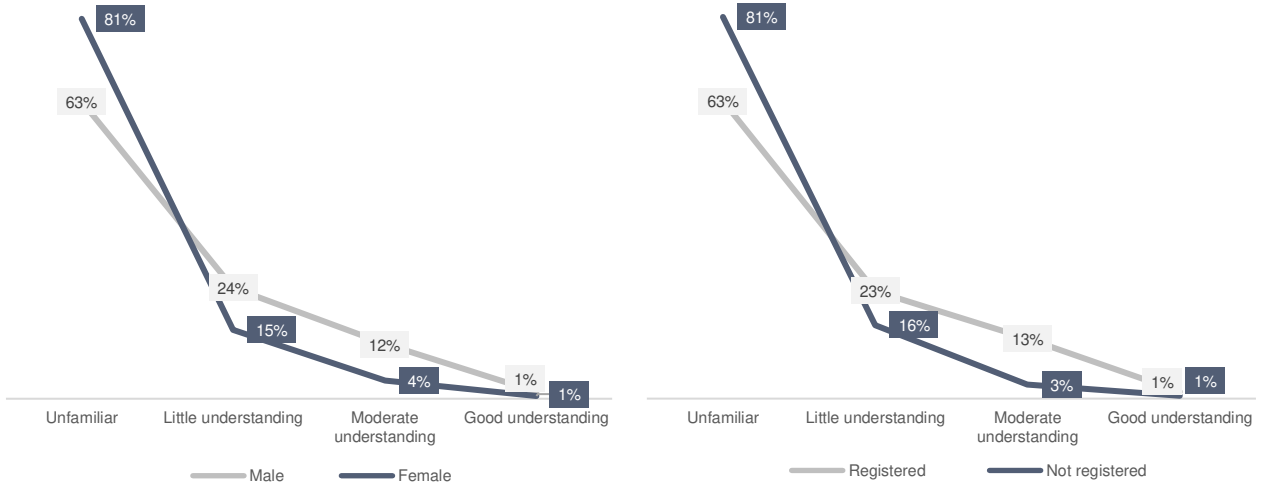*Figure C. 14: Awareness of government policies and support by gender of top manager and registration status*

Figure C. 15: Reasons for not using government supports to digitalize