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# EVALUATING THE ROLE OF DIGITAL TECHNOLOGY IN BOOSTING MSME PRODUCTIVITY IN CAMBODIA'S TOURISM SECTOR

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**ABSTRACT**

This research examines the impact of digital technologies on the productivity of Micro, Small and Medium Enterprises in Cambodia's tourism sector. Drawing from extensive survey data, the study confirms that higher DT investments correlate with increased productivity. Notably, MSMEs at the intermediate level of DT integration experience a marked 16 percent productivity increase compared to basic DT adopters. This highlights the value of digital tools like websites, social media engagement, and e-payment systems. The study emphasises the need for a robust digital strategy for MSMEs and suggests that policymakers prioritise measures to encourage deeper digital integration in Cambodia's tourism sector.

## 1. Introduction

Powered by cutting-edge technologies such as the Internet of Things (IoT), artificial intelligence (AI), and cloud computing, digital technology (hereafter referred to as DT) has advanced and spread at a rapid speed and had a significant impact on the global economy and businesses (Atkinson and McKay 2007; WB 2016). Particularly for businesses, digital transformation affects the way an organisation operates. DT, such as computers, software, automation, and artificial intelligence, have increased work processes' efficiency, accuracy, and speed, improving productivity (Deloitte 2019; Tan and Chian 2019; Cirillo, Fanti, and Mina 2022). Remote work is another way that DT has increased productivity. The COVID-19 pandemic has demonstrated that DT such as video conferencing, instant messaging, and collaborative software enable many businesses to operate effectively with a remote workforce. There is anecdotal evidence that businesses with a higher level of digitalisation are more efficient and productive. For instance, small and medium-sized businesses (SMEs) in Singapore that implement DT see 16 percent increases in productivity (Tan and Chian 2019). In Australia, productivity gains from DT are found to be more significant. According to Deloitte (2019), SMEs with advanced levels of digital engagement are 60 percent more productive than businesses with basic levels of digital engagement.

Although DT adoption has been rising in recent years, most Micro, Small and Medium Enterprises (MSMEs) in the Cambodian tourism industry have been using basic digital technologies (TAF and CDRI 2023). A lack of awareness and comprehension of DT is one of the most significant obstacles for MSMEs, along with a lack of financial resources, inadequate internet infrastructure, and a digitally illiterate workforce. As the repercussions of the COVID-19 outbreak continue, more and

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more businesses rely on DT to reduce risks, streamline operations, and boost productivity (TAF and CDRI 2023). Recent data indicates a notable increase in e-commerce trends in Cambodia amidst the pandemic, along with more people using smartphones, social media, and other digital platforms (UNCTAD 2022). TAF and CDRI (2023) also note that MSMEs within Cambodia's tourism sector experienced considerable effects from the COVID-19 pandemic, with 72 percent witnessing major reductions in revenues, while 8 percent remained unaffected. In response to COVID-19, approximately half of MSMEs reported investing in new technologies or digital solutions (TAF and CDRI 2023). As the economy undergoes growing digitalisation and more businesses adopt advanced DT, this article examines the empirical relationship with productivity.

## 2. Methodology

### *2.1. Econometric specification*

To comprehend the relationship between DT and productivity, we employ the firm heterogeneity framework pioneered by Bernard and Jensen (2004), Bernard et al. (2012) and Melitz (2008), which states that a company's performance depends on its use of DT and other firm characteristics. The casual relationship between DT adoption and firm performance can be expressed as follows:

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

Where subscript *i* denotes firm and *s* is sector. $Prod_{is}$ denotes labour productivity. We follow several seminal works, including Amiti and Konings (2007); Amiti and Wei (2009); and Görg et al. (2008), and use the log of sales per worker as a proxy for labour productivity. We expect a positive relationship between DT adoption and labour productivity.

In our model, $digital_{is}$ refers to DT adoption, which is measured by two variables. The first metric is DT investment ($dig\_invest_{is}$), the total annual spending on digital platforms, software, hardware, and other technologies, including the internet, digital marketing, and clouding. Businesses that invest more in DT are considered to have a greater DT adoption rate, and as a result, anticipate improved productivity. Second, our study follows ERIA (2019) and gauges DT adoption by summing 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 responses give a minimum scale of 0, a maximum scale of 10, and we found an average value of 3.28. MSMEs in the early stages of DT adoption score 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 are as follows: 62.0 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 hypothesise that MSMEs will perform better in revenue and productivity if they embrace higher DT.

$X_{is}$ is a vector of firm characteristics, including age, ownership structure, access to finance, training and skill intensity that collectively affect firm performance. Age ($age_{is}$) refers to the number of years in operation. Foreign ownership ($for\_own_{is}$) variable takes value 1 if the establishment is foreign-

owned and 0 otherwise. Our study follows the definition of a foreign firm by Duce and España (2003) using a benchmark of 10 percent of foreign capital as a threshold level. We define a firm with better access to finance ($acc\_fin_{is}$) as those with a credit line/loan from a financial institution. 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 a diploma or higher education. 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.

To account for the unobserved factors that may affect firm performance across different sectors and locations, our econometric specification also includes the sector-fixed effect $d_s$ and location-fixed effect $d_l$. The sector-fixed effect captures the average difference in firm performance across sectors, while the location-fixed effect captures the average difference in firm performance across locations within a sector. By including these fixed effects in our econometric specification, we are able to control for the unobserved factors that may be specific to each sector and location, allowing us to isolate the true effect of the variables of interest on firm performance. The Ordinary Least Squares (OLS) method is a widely used statistical technique for estimating the relationships among variables. In this context, the OLS approach is employed to estimate equation (1), as it provides efficient estimates of the coefficients.

### *2.2. Source of data*

The primary data source for our empirical analysis is the results from 1000 surveys of MSMEs in the tourism sector in Cambodia. The total samples were randomly selected from seven provinces: Phnom Penh, Siem Reap, Preah Sihanouk, Kampot, Mundolkiri, Ratanakkiri and Koh Kong. Regarding sample size distribution, 495 are micro enterprises, 439 are small enterprises, and 66 are medium-sized businesses. In addition, we select a representative sample from four broad sub-sectors: accommodation, restaurant and food, travel agencies, transportation, and entertainment. The survey commenced on October 19, 2022 and concluded on November 5 of the same year. After eliminating observations with missing data for any variable, 894 observations were remaining for analysis (Table 1 displays summary statistics).

Table 1: Summary statistics

| Variable | Observation | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|
| Sales (in USD) | 988 | 29946.9 | 108736.1 | 0 | 1902485 |
| Age (in years) | 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 |

Source: Authors' calculations

# 3. Empirical findings

## *3.1. Baseline results*

Before examining the empirical findings, we assessed potential multicollinearity in our regression. This was done by running a correlation matrix among the independent variables and applying the variance inflation factor (VIF) method. With correlation coefficients for all variables significantly below 0.5 and VIF values for each independent variable under 4 (the widely accepted threshold), we determined that multicollinearity did not impact our regression. It is worth mentioning that we conducted several regression diagnostic tests to assess the alignment of our data with the OLS regression assumptions. Our initial step involved analysing the normality of the residuals[1]. The results show a minor departure from the normal distribution, leading us to infer that the residuals were nearly normally distributed. We then tested for heteroscedasticity[2] to evaluate the fit of our model. Given that the p-values from most tests were notably low, we argued that the residual variance was not homogeneous. In the end, we conducted a regression specification error test[3] (RESET) to check any omitted variables. Our test findings implied that our regression models were appropriately specified. Table 2 displays initial findings on the impact of digital technology adoption on productivity.

Table 2: Estimation results for digital technology adoption and productivity. Standard errors represented in parentheses below each coefficient.

| Labour productivity | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| Age | 0.00843 | -0.00268 | -0.00386 | -0.0184 | -0.00132 | -0.0123 |
| | (0.0449) | (0.0455) | (0.0450) | (0.0447) | (0.0488) | (0.0476) |
| Foreign ownership | 0.118 | 0.0821 | 0.0703 | 0.0656 | 0.0756 | 0.0570 |
| | (0.199) | (0.203) | (0.197) | (0.195) | (0.200) | (0.202) |
| Access to finance | -0.0427 | -0.0285 | -0.0271 | -0.0714 | -0.0216 | -0.0107 |
| | (0.0791) | (0.0791) | (0.0794) | (0.0795) | (0.0818) | (0.0819) |
| Training | 0.181* | 0.209** | | 0.0873* | 0.189** | |
| | (0.0925) | (0.0954) | | (0.0897) | (0.0941) | |
| Skill intensity | 0.0212 | 0.0211 | 0.0214 | 0.00666 | 0.0196 | 0.0193 |
| | (0.0149) | (0.0157) | (0.0152) | (0.0135) | (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 investment per labour | | | | 0.0329*** | | |
| | | | | (0.0104) | | |
| DT adoption | | | | | 0.167** | |
| | | | | | (0.0821) | |
| DT adoption # training | | | | | | 0.201*** |
| | | | | | | (0.0725) |
| Observations | 760 | 760 | 760 | 760 | 725 | 725 |
| R-squared | 0.143 | 0.128 | 0.134 | 0.126 | 0.135 | 0.134 |
| Sector-FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Location-FE | Yes | Yes | Yes | Yes | Yes | Yes |

*Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1*
Source: Authors' calculations

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

2 After conducting a regression analysis, the '*estat httest*' command is executed.

3 The STATA command for this test is 'ovtest'.

Before delving into the impact of digital technology on productivity, we first discuss the results for other firm-level characteristics. Both age and access to finance exhibit negative coefficients, albeit insignificant, indicating their negligible influence on a firm's productivity. Despite a positive coefficient, foreign ownership was also found to have no discernible impact on labour productivity. In most specifications, training coefficients were positive and significant, highlighting the positive influence of training programmes on productivity. The coefficient for skill intensity is positive but statistically insignificant, indicating that the contribution of workforce skills to productivity enhancement is negligible.

Numerous forms of digital technology have been found to correlate positively with productivity. First, findings in Columns 1 and 2 in Table 2 suggest that MSMEs should invest in hardware, software, cloud computing, networks, and digital platforms to increase productivity. We delve deeper by incorporating two interaction terms: one between DT investment and online sales, and the other between DT investment and training. Both interactions have positive and significant coefficients, highlighting the importance of pivoting business strategies during the pandemic toward online sales and digital investment. Precisely, businesses that allocated more resources to digital technology and transitioned to online sales outperformed their competitors in productivity. Additionally, MSMEs with employee training programmes experienced more pronounced productivity enhancement from DT investment. To bolster the reliability of our results, we substituted DT investment with DT investment per labour. This modification ensures a tighter alignment between our independent variable and the normalisation of our dependent variable, labour productivity. The coefficient for DT investment per labour as shown in Column 4 of Table 2 is both positive and significant, indicating that an increase in digital investment per employee is associated with higher labour productivity. This suggests that firms that allocate more resources towards digital technologies for each worker are likely to experience improved productivity levels. The positive coefficient further supports the notion that investing in digital technologies can have a tangible impact on overall business performance.

Secondly, labour productivity positively correlates with DT adoption, suggesting that digital technology brings about productivity enhancements. Put simply, MSMEs with higher DT adoption tend to be more productive. For MSMEs in the tourism sector, having websites, frequent utilisation of social media and networks, heightened activity on digital platforms, and using e-payment methods are pivotal. These elements not only streamline operations and bolster communication but also expand their customer reach. Collectively, these aspects contribute to improved efficiency and productivity.

### *3.2. 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, a measure is constructed for each state of DT adoption. We introduce and estimate each DT adoption stage separately in equation (1) to avoid an unnecessary multicollinearity issue in our specification. The results of DT adoption on productivity are given in Columns 1, 2 and 3 of Table 3. The estimation indicates that while basic DT adoption doesn't show a significant correlation, intermediate DT adoption does positively correlate with labour productivity. This suggests that in order for MSMEs in the tourism industry to boost productivity, technological tools and fundamental software aren't enough. A comprehensive digital transformation is essential, encompassing the establishment of a website, increased engagement in social media and networks, heightened activity on digital platforms, and the adoption of e-payment systems. It is argued that the pandemic has emphasised the significance of digitalisation in boosting productivity for MSMEs. However, for the advanced stage of digital technology adoption, the coefficient turns negative, albeit insignificantly. This suggests that there is

not concrete evidence to support the hypothesis that MSMEs in the tourism sector have enhanced productivity by employing advanced tools and software, such as cutting-edge accounting, customer relationship management, and data analytics.

Table 3: Estimation results for different stages of DT adoption

| | Labour productivity | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Age | 0.0814 | 0.0828 | 0.111 | 0.00990 |
| | (0.200) | (0.201) | (0.202) | (0.0461) |
| Foreign ownership | -0.0369 | -0.0431 | -0.0489 | -0.112 |
| | (0.0796) | (0.0795) | (0.0801) | (0.216) |
| Access to finance | 0.212** | 0.216** | 0.242** | -0.0248 |
| | (0.0955) | (0.0952) | (0.0947) | (0.0811) |
| Training | 0.0201 | 0.0220 | 0.0239 | 0.197** |
| | (0.0160) | (0.0166) | (0.0176) | (0.0973) |
| Skill intensity | -0.0059 | -0.0051 | -0.0144 | 0.00579 |
| | (0.0455) | (0.0455) | (0.0453) | (0.0186) |
| Basic DT adoption | -0.124 | | | |
| | (0.0967) | | | |
| Intermediate DT adoption | | 0.158* | | |
| | | (0.0942) | | |
| Advanced DT adoption | | | -0.163 | |
| | | | (0.191) | |
| DT adoption (1=intermediate stage; 0=basic stage) | | | | 0.157* |
| | | | | (0.100) |
| Observations | 760 | 760 | 760 | 703 |
| R-squared | 0.126 | 0.128 | 0.126 | 0.132 |
| Sector-FE | Yes | Yes | Yes | Yes |
| Location-FE | Yes | Yes | Yes | Yes |

Robust standard errors in parentheses

*** $p<0.01$, ** $p<0.05$, * $p<0.1$. Source: Authors' calculations

To compare the productivity gains from DT adoption between firms at the basic stage and those at the intermediate stage, we refine our baseline specification and employ a second equation. In this 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 value 0 for firms at the basic stage. We compare productivity gains between these two business categories for two reasons. Firstly, as evident from our prior analysis, the majority of MSMEs adopt DT by acquiring digital devices and connecting to the internet. However, such foundational digitalisation has not shown a significant increase in productivity. Secondly, our findings indicate that enterprises employing a business model that integrates a website, digital platform, social media, and electronic payment (representing the intermediate DT adoption phase) tend to outperform their smaller counterparts, especially in terms of productivity. This motivates us to evaluate the disparity in gains and to ascertain if the incremental benefits warrant the transitioning MSMEs from the basic to the intermediate DT adoption stage. Column 4 in Table 3 illustrates the outcome of productivity gains from adopting intermediate DT. MSMEs at the intermediate stage of DT adoption exhibit a productivity level that is 16 percent greater than their counterparts at the basic stage. This suggests that MSMEs that have advanced beyond the basic stage of DT adoption are reaping the benefits of increased productivity. These gains can be attributed to the implementation of more advanced digital technologies and processes, which enable these businesses to streamline operations, enhance efficiency, and ultimately improve their overall performance.

## 4. Conclusion

This study leverages firm-level survey data from MSMEs within Cambodia's tourism sector to empirically assess the impact of digital technologies on productivity. Our results align well with prior research, highlighting the positive influence of digital technologies on firm productivity. Specifically, MSMEs with higher DT investments tend to be more productive. Those shifting towards online sales and marketing, coupled with employee training, receive enhanced benefits from their DT investments. Notably, when dissecting DT adoption stages, only MSMEs at the intermediate level see tangible benefits from digital integration. This study offers pivotal insights for policymakers and MSMEs in Cambodia's tourism sector. By showing the tangible benefits of digital technology adoption, our results stress the importance of a comprehensive digital strategy for enhancing productivity. The findings advocate for businesses to move beyond basic digital practices and for policymakers to craft supportive measures promoting deeper digital integration.

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