



## Why is technology adoption not optimised? E-commerce business investigation in Java Island, Indonesia

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### ABSTRACT

Technology adoption is essential to increase business competitiveness and performance. Technology can be adopted regarding sales media, payment, and shipping methods. Statistics Indonesia reports that as of June 30, 2021, businesses in Indonesia are still dominated by conventional types of business, with only 25.92% of companies conducting e-commerce activities. However, even businesses already doing e-commerce still use simple technology through instant messaging and social media. Technologies with more relevant features to sales, such as marketplaces and websites, are not used optimally. The low technology adoption can also be seen from the payment method, which is still dominated by cash at 77%, and the delivery method by face-to-face at 85%. Therefore, this research investigates why e-commerce businesses in Java have not been optimal in adopting technology. This study used raw data from the 2021 e-commerce survey conducted by Statistics Indonesia. The population in this study was all e-commerce businesses on the island of Java, totaling 1,774,589 units, with a sample of 5,543 units. The results of this study indicate that the variables of education, training, age, gender, capital, and labor issues tend to be related to technology adoption. The variable delivery service limitations tend not to be related to technology adoption.

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### INTRODUCTION

Technology has sparked a leading revolution in the emergence of internet-based businesses (Jiménez-Rodríguez et al., 2022; OECD, 2019), or what is commonly referred to as an e-commerce business. Many innovations have emerged in product advertising, sales media, payment, and delivery methods through technology. E-commerce can be defined as the process of buying and selling products or services electronically (Costa & Castro, 2021). Goods or services are ordered with these methods, but

payment and final delivery of goods or services do not have to be done online. Not included in e-commerce transactions are orders placed by telephone or facsimile (BPS, 2021; OECD, 2013).

More than that, according to Tan & Li (2022), the internet has important implications for economic development and poverty alleviation in developing countries. The characteristics of developing countries dominated by micro and small businesses cause the performance of these businesses to impact welfare directly. Costa & Castro (2021) revealed that small and

medium enterprises dominate in nearly every job-generating industry. Most households in Indonesia depend on micro and small enterprises for income (Trinugroho et al., 2022). This can be seen from e-commerce businesses in the island of Java, which are dominated by micro-enterprises with a gain of fewer than 300 million rupiahs per year, amounting to 82.07% (BPS, 2021).

The opportunity to use online trading methods can be done for large companies and provides the same potential benefits for small and medium businesses (Costa & Castro, 2021). With technology, market reach becomes wider (Ha, 2020; Susanty et al., 2020) while bringing a business unit closer to its customers at a low cost and short time (Saridakis et al., 2019). Thus the use of internet media has the opportunity to increase business competitiveness and business scale.

Not only does internet technology have a positive impact on entrepreneurs, but it also benefits consumers. An online shop that can be accessed 24 hours a day allows customers to buy at any time (Ünver & Alkan, 2022). In fact, with such broad access, customers can gather information about a product, both in terms of quality and price, at no cost (Wirdiyanti et al., 2022). Accessibility, flexibility, and convenience make the internet the ideal platform for the modern-day consumer (Costa & Castro, 2021).

Behind these various advantages, digital technology brings risks for micro and small businesses (Roy et al., 2018; Skare et al., 2023). New technology changes how a company operates (Khurana et al., 2022) and eliminates business units that are still consistent with conventional methods. Meanwhile, for businesses that have adopted e-commerce, competition among companies is also getting more challenging. Often these e-commerce businesses have difficulty getting customers because many online stores sell the same or similar products. The side of trust from customers is also often a problem. Customers are still often unsure about buying products online for fear of being scammed or concern about payment security. Another obstacle is the delivery problem, where loss or damage can cause customer disappointment.

Despite these drawbacks, technology adoption is fresh air for entrepreneurs in increasing their competitiveness and business performance (Trinugroho et al., 2022). Bank Indonesia estimates that the value of Indonesian e-commerce transactions in 2021 or at the time of the Covid-19 pandemic would

reach IDR 401.25 trillion, with total marketing of more than 1.73 billion transactions (Alfian, 2022). This tremendous business value results from government policies limiting movement and physical interaction during the Covid 19 pandemic.

E-commerce is one of the leading solutions during the Covid-19 pandemic adopted by consumers to access purchasing products and services, even consumers who have not previously used e-commerce (Higueras-Castillo et al., 2023; Kawasaki et al., 2022; Nicewicz & Bilska, 2021). Even Costa & Castro (2021) emphasized that SMEs must go online because electronic commerce is a way out for business resilience and survival. E-commerce businesses that have survived the shocks of a pandemic have illustrated that digital technology provides opportunities for businesses to adapt to unexpected disruptions. Caballero-Morales (2021) demonstrated that digital resources such as the internet and communication platforms (WhatsApp, ZOOM, Skype) are critical facilitators for SMEs to maintain networks and create innovative products, which ultimately help them survive during and after Covid-19.

Statistics Indonesia reported that from data collection on all businesses up to June 30, 2021, only 25.92% of companies conduct e-commerce activities. This shows that conventional types of businesses still dominate industries in Indonesia. Most businesses (73.07%) do not carry out e-commerce activities because they are more comfortable selling directly (offline). The next reasons of doing conventional business are not being interested in selling online and lacking knowledge or expertise (BPS, 2021).

The number of e-commerce businesses in Indonesia in 2020 reached 2,361,423 business units (BPS, 2021). The companies were concentrated in Java island, reaching 75.26% or as many as 1,774,589. E-commerce businesses in Java island are dominated by micro businesses with an income of fewer than 300 million rupiahs per year, accounting for 82.07% (BPS, 2021).

Another problem experienced by e-commerce businesses in Java island is that only 25% of companies have financial reports. This shows that there is low awareness of financial management. In fact, financial statements are crucial not only for large companies but also for small and medium businesses (BPS, 2021). Financial reports are helpful in assessing company performance financially, analyzing which products bring optimal benefits, and evaluating

operational costs, and are valuable as material for consideration in obtaining a business loan (Stuebs et al., 2022).

The Ministry of Communication and Informatics (Kominfo, 2022) launched Indonesia's digital society index score for 2022, reaching 37.8 out of a maximum score of 100. The Minister of Communication and Informatics highlighted Indonesia's low digital literacy rate, which is still below the average of ASEAN countries. This is in line with what happens to businesses in e-commerce in Java island, which totaled 1,774,589 units (BPS, 2021). Rapidly developing technology has not been optimally utilized by the business world in terms of sales media, payment methods, and shipping methods. For the sales media aspect, an illustration of low technology adoption is shown in Table 1.

Table 1. The Sales Media Used by E-commerce Businesses in Java Island in 2020

Sales media	Use	Not Use	Total
	% .....		
Instant message	94	6	100
Social media	50	50	100
Marketplace	24	76	100
Email	11	89	100
Website	3	97	100

Source: BPS (2021), processed

Table 1 shows that e-commerce businesses in Java use relatively simple technology, instant messaging, and social media. This media is too simple to run a company because of limited features and customer reach. Adequate media for running a business are marketplaces and websites. The marketplace is a meeting place for sellers and buyers (Selvi Dass & Gapar Md Johar, 2022), with various features that can support the business. Given the profile of entrepreneurs and the business scale of e-commerce businesses in Java island, marketplaces are pretty much possible for entrepreneurs to run. Website media is the media that e-commerce entrepreneurs rarely use. Website media requires the availability of human resources with high ICT knowledge to build websites. This media is not usable considering that 78% of e-commerce entrepreneurs in Java island have a high school education and below, and only 8% attended training on technology for digital marketing.

The low adoption of technology can also be seen from the payment method, which is still dominated by cash, by 77%. The convenience offered by fintech

cannot make it a mainstay in payments. Instead, cash is the most frequently used payment method. COD is done by paying for the order in cash at the purchase location using cash or paying when the order arrives at the destination. This happens despite the adoption of technology in the payment system especially in terms of convenience (Tut, 2023) that the use of a smartphone has. In addition, transactions can be done anywhere and anytime. A cashless system can also help speed up the payment process at restaurants, shops, or other places by simply scanning. In addition, cashless mechanism also facilitates financial management because transactions that have been made can be tracked in detail. In addition, it minimizes the risk of losing cash or theft.

The delivery method is not spared from the low adoption of technology, which can be seen from the majority of entrepreneurs making face-to-face deliveries by 85%. The examples are food, beverage, and food ingredients group, which were mostly delivered via the internet in 2020, at 40.86%. From Table 2, it can be seen that among entrepreneurs who sell food, only 11% of e-commerce entrepreneurs use online delivery services. As for entrepreneurs who do not sell food, only 18% use online delivery services. This is quite concerning, considering the e-commerce survey data collection describes business conditions during a pandemic, where technology adoption should be optimised more than before the pandemic (Wang et al., 2021), due to restrictions on shopping in physical stores and people working and studying from home.

Table 2. Adoption of Technology in The Delivery Aspect by Type of Food and Non-Food Commodities

Method/Commodity Type	Food	Non Food
	% .....	
Non face to face (Online)	11	18
Face to face	89	82
Total	100	100

Source: BPS (2021), processed

This study combines the Technology Acceptance Model (TAM) and barrier factors to examine technology adoption by entrepreneurs, which is still rarely done by other researchers (Doanh et al., 2022). TAM is often used in behavioral research about technology acceptance, such as in information systems (Belletier et al., 2018) or technology adoption (Caffaro et al., 2020; Doanh et al., 2022). TAM

includes two factors: perceived usefulness (PU) and perceived ease of use (PEU) (Davis, 1989). PU describes the extent to which entrepreneurs believe using the application will benefit their business (Doanh et al., 2022). PEU shows the importance that entrepreneurs feel they do not need to put great mental and physical effort into their business through technology (Alturki & Aldraiweesh, 2021).

The importance of technology adoption for micro, small, and medium enterprises has been confirmed by several previous studies, especially its benefits in increasing business performance and competitiveness. Trinugroho et al. (2022) examined the adoption of digital technology for micro and small businesses in Indonesia. Adoption measurement is done through 3 things: online marketing, point of sales availability, and online payments. Doanh et al. (2022) combined the Technology Acceptance Model (TAM) and barrier factors to examine the intention of tea farmers in Vietnam to participate in live stream sales in Vietnam. This study seeks to investigate why e-commerce businesses in Java have not been optimal in adopting technology. The discussion regarding technology adoption is not only analyzed in terms of sales media, but also reviews in terms of payment methods and shipping methods.

Achieving the research objectives, this study follows research by Trinugroho et al. (2022) to conduct a discussion from the perspective of the entrepreneur factor, which is the leading actor determining the success or failure of a business. In addition, this study also reviews how problems with capital, labor, and delivery service limitations are related to technology adoption. Concerning the Technology Acceptance Model (TAM), which includes perceived usefulness (PU) and perceived ease of use (PEU), this study seeks to analyze how business factors adopt technology in their business processes. The entrepreneur factor is analyzed regarding education, training, age, and gender, because entrepreneurs with low education and training (digital literacy) and old age cause them to be less aware of the benefits of information technology and its ease of use (Doanh et al., 2022). Moreover, the constraints experienced by entrepreneurs, be it the lack of capital, the unskilled labor force, and the constraints on limited delivery services, exacerbated the low adoption of technology. To adopt technology optimally, capital in the form of funds and a workforce

that can operate technology properly is required. Online delivery services that are adequately available are also needed. By discussing the entrepreneur factor and the constraints they face, this research is expected to contribute to providing a comprehensive study of technology adoption by a business entity in developing countries, as well as being a reference for taking strategic steps to optimize the use of technology by the e-commerce business units so that performance increases.

## RESEARCH METHOD

This study of technology adoption by e-commerce businesses in Java is quantitative with an empirical case approach. This study used secondary data obtained from the 2021 e-commerce raw data survey held by Statistics Indonesia. The population in this study included all e-commerce businesses in Java island in 2020 with a total of 1,774,589 units, with a research sample of 5,543 units.

E-commerce survey is an annual data collection that has been routinely carried out by BPS since 2019. In 2021, BPS conducted an e-commerce survey to get an overview of business conditions in 2020 by registering all businesses (listings) in 5,394 selected census blocks in 34 provinces throughout Indonesia which include 303 regencies/cities. Interviews were then conducted on 11,928 businesses that were the selected sample. This data collection involved 1,901 enumerators and 484 supervisors. The scope of the 2021 e-commerce survey was businesses that used the internet to receive orders or sell goods and services during 2020. This activity is part of the First National Priority Program, "Strengthening Economic Resilience for Quality and Equitable Growth."

This study examines the determinants of technology adoption in e-commerce businesses in Java island, therefore this study referred to research by Trinugroho et al. (2022). The dependent variable in this empirical study is the adoption of technology-based innovations. There were three models to measure the type and level of adoption of technology-based innovations by e-commerce businesses in Java. First, the sales media aspect, divided into five media: instant messenger, social media, marketplace, email, and website. Second, the aspect of the payment method, and lastly, the aspect of the delivery method.

Table 3. Variable Measurement

No	Variable	Definition	Size
<b>Dependent Variable :</b>			
<u>Model 1: Sales Media Aspects</u>			
1	Instan Messenger	Businessman sells his product via instant messaging	1 = yes, 0 = no
2	Social Media	Businessman selling his product via social media	1 = yes, 0 = no
3	Marketplace	Entrepreneurs sell their products through the marketplace	1 = yes, 0 = no
4	Email	Businessman selling his product by email	1 = yes, 0 = no
5	Website	Entrepreneurs sell their products through websites	1 = yes, 0 = no
<u>Model 2. Aspects of Payment Methods</u>			
6	Payment Method	Payment methods used by employers	1 = fintech, 0 = non-fintech
<u>Model 3. Aspects of Delivery Methods</u>			
7	Delivery Method	Shipping methods used by employers	1 = non-face to face (online) 0 = face to face
<b>Independent Variable</b>			
1	Education	Business owner education	1 = college, 0 = high school and below
2	Training	Training related to the use of information technology for digital marketing	1 = yes, 0 = no
3	Age owner	Age of business owner	the age of the business owner
4	Gender	Gender of business owner	1 = male, 0 = female
5	Lack of Capital	Entrepreneurs experience a lack of capital	1 = yes, 0 = no
6	Lack Skilled Workforce	The workforce owned by the business unit is less skilled	1 = yes, 0 = no
7	Limited Delivery Services	Entrepreneurs face the constraints of limited delivery services	1 = yes, 0 = no

Sales media was measured as a dummy variable 1 if the entrepreneur sold his product via instant messenger, social media, marketplace, email and website, and 0 otherwise. This was done because online marketing, including social media, is now an important component of marketing strategy (Sharma et al., 2020; Trinugroho et al., 2022). The payment method was measured as a dummy variable 1 if the entrepreneur used cashless to receive payments, and 0 otherwise. The shipping method was measured as a dummy variable 1 if the entrepreneur used the online method in the process of sending goods, and 0 if it is manual.

As for the explanatory variables, this study seeks to investigate the entrepreneur factor which is the main actor in business. The entrepreneurial factor was proxied by four variables. First, the entrepreneur's education was measured using the dummy variable 1 if the entrepreneur had an education up to university level, and 0 if the entrepreneur has a high school education and below. Second, training was measured using a dummy variable 1 if entrepreneurs took part in training related to the use of information technology for digital marketing, and 0 otherwise. Third, the age of the entrepreneur. Fourth, the gender of the entrepreneur as measured by the dummy variable was

1 if the entrepreneur is male and 0 if the entrepreneur is female.

The independent variable then included the constraints that entrepreneurs faced in running their businesses, including constraints on lack of capital, unskilled labor, and limited delivery services. Detailed explanations of all variables can be seen in Table 3.

For more details, an overview of the framework in this study is presented in Figure 1.

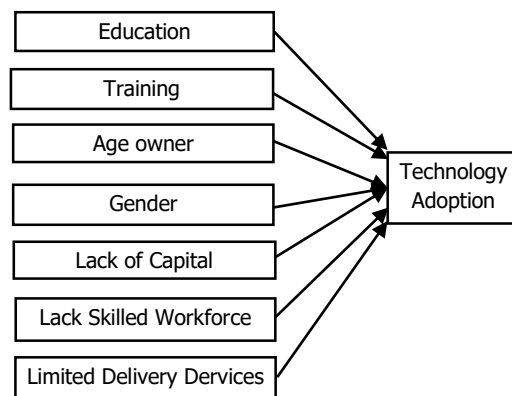


Figure 1. Research flow chart

This study used two methods of analysis. Descriptive analysis was used to obtain an overview of the description of e-commerce businesses in Java, consisting of business distribution, business categories, and entrepreneur profiles, as well as the obstacles entrepreneurs face in running their businesses. Furthermore, inferential analysis was used to find out how the independent variables influenced the dependent variable using binary logistic regression analysis with the help of SPSS 26 software.

Binary logistic regression is an analytical method with the dependent variable in the form of categorical and dichotomous data. To do so, Hosmer-Lemeshow goodness-of-fit test was done to ensure that the model in the study fit the data (Deng et al., 2022). Furthermore, data analysis was carried out using the odds ratio, a measure to see how big the tendency of the independent variable is toward the dependent variable. The odds ratio is the exponential of the coefficients. Odds ratios make interpretation easier and better (Wang et al., 2021). The equation in binary logistic regression can be formulated as follows:

$$\begin{aligned} \text{technology\_adoption} = & \beta_0 + \beta_1 \text{education} + \\ & \beta_2 \text{training} + \beta_3 \text{age\_owner} + \beta_4 \text{gender} + \\ & \beta_5 \text{lack\_of\_capital} + \\ & \beta_6 \text{lack\_skilled\_workforce} + \\ & \beta_7 \text{limited\_delivery\_services} + \varepsilon \end{aligned}$$

It should be noted that technology adoption was analyzed from the aspect of sales media in the form of instant messengers, social media, marketplaces, websites, and email, as well as the use of technology in payment and delivery methods.

## RESULT AND DISCUSSION

### Overview of E-commerce Businesses in Java

In 2020, e-commerce businesses in Indonesia would be concentrated in Java Island, with 1,774,589 units (75.26%), as presented in Table 4. The tendency to concentrate e-commerce businesses in economic centers such as Java Island can be due to the presence of complete infrastructure and a large market potential because a large population supports it. The existence of transportation infrastructure such as good roads will expedite the delivery of goods, thereby increasing consumer satisfaction. Meanwhile,

the existence of fast internet infrastructure with wide coverage makes it easier for e-commerce players and consumers to conduct e-commerce transactions.

Table 4. Distribution of E-commerce Businesses in Java Island In 2020

Province	Number	Percentage
		%
31 DKI Jakarta	218,582	9,26
32 West Java	473,283	20,05
33 Central Java	406,911	17,23
34 DIY	147,781	6,26
35 East Java	467,996	19,82
36 Banten	60,036	2,64
Java Island	1,774,589	75,26

Source: BPS (2021)

When grouped according to business field category (KBLI), it can be seen that almost half of the e-commerce business sector in Java is in the trading business category (46.85%). The second and third positions, respectively, were occupied by businesses in the Processing Industry sector (15.73%) and the Provision of Accommodation and Provision of Food and Drink (15.30%). The proportion of e-commerce businesses by business category is presented in full in the following Table 5.

Based on Table 5, e-commerce businesses in Java island were dominated by companies engaged in trade wholesale and Retail, Repair, and Maintenance of Cars and Motorcycles by 46.85%. The second and third orders were businesses in the Manufacturing Industry sector at 15.73%, and Provision of Accommodation and Food and Drink by 15.30%.

### Overview of Entrepreneurs and Constraints

Entrepreneurs determine the success of technology adoption in e-commerce businesses. Adaptive entrepreneurs will readily accept new technologies that will increase the chances of their business success. One effort to accelerate technology adoption is to attend training. Based on Table 6, only 8.3% of e-commerce entrepreneurs in Java received training. In contrast, the rest never received training. Entrepreneurs who received training were dominated by entrepreneurs with a high school education and below 67.5%, while only 32.5% came from tertiary institutions.

Table 5. Categories of E-Commerce Businesses in Java island

Business Category	Proportion %
A -- Agriculture, Forestry, and Fisheries	3.32
C -- Processing Industry	15.73
G -- Wholesale and Retail Trade, Car and Motorcycle Repair and Maintenance	46.85
H -- Transportation and Warehousing	5.48
I -- Provision of Accommodation and Provision of Food and Drink	15.30
J -- Information and Communication	3.59
M -- Professional, Scientific and Technical Activities	0.45
N -- Leasing and Leasing Activities Without Option Rights, Employment, Travel Agents, and Other Business Support	1.10
P -- Education (except those with formal status)	0.69
Q -- Community Health Activities and Social Activities	0.36
R -- Arts, Entertainment and Recreation	0.40
S -- Other Service Activities	6.73
Total	100.00

Source: BPS (2021), processed

Table 6. Percentage of E-commerce Entrepreneurs by Education and Training in Java island in 2020

Education	Get Training %	Not Get Training %
College	2.7	19.6
High school and below	5.6	72.1
Total	8.3	91.7

Source: BPS (2021), processed

According to the demographic structure, productive age entrepreneurs (15 to 64 years) dominated the ownership of e-commerce businesses in Java island. When viewed by gender, male entrepreneurs were more dominant than women, both at productive and non-productive ages (see Table 7). The business profile, which influential age entrepreneurs dominated, is a potential for developing e-commerce businesses because effective age entrepreneurs are more receptive to innovations, including technology adoption (Trinugroho et al., 2022).

In running their business, entrepreneurs face different main obstacles. As many as 37% of e-commerce entrepreneurs in Java island admitted that they experienced the main block in the form of a lack of capital. In comparison, only 6% of entrepreneurs faced a shortage of skilled workers, and entrepreneurs who shared the main obstacle of limited delivery services were only 3%.

Table 7. Percentage of E-commerce Businesses by Gender and Age of Entrepreneurs in Java island in 2020

Gender/Age	Productive %	Non Productive %	Total
Men	96	4	100
Women	97	3	100

Source: BPS (2021), processed

### Research Findings

This study used logistic regression to analyze technology adoption from sales media, payment, and delivery methods. Researchers made three research models. Model I was divided into five types of sales media, while models II and III each captured technology adoption in the aspects of payment methods and delivery methods (Table 8). Based on the goodness of fit test, the Hosmer-Lemesow significance value of the seven analyses was above 0.05. This means that the model fits the data.

### Sales Media Aspects

In today's digital era, electronic commerce is a common activity in everyday life (Jiménez-Rodríguez et al., 2022). Online sales can be made through various media, including instant messengers, social media, marketplaces, email, and websites, so this research models technology adoption based on each of these media.

Table 8. Technology Adoption Logistic Regression Modeling

Independent Variable			Dependent Variable						
			Model I (Sales Media)					Model II (Payment Method)	Method III (Delivery Method)
			Instant Messenger	Social Media	Market place	E-Mail	Website	payment_ method	delivery_ method
			1	2	3	4	5	6	7
1	Education	coefficient	0.125	0.627	0.515	1,255	1,464	0.783	0.587
		odds ratio	1.133	1872	1673	3,506	4,321	2,188	1,798
		Sig.	0.367	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***
2	Training	coefficient	-1,194	0.663	0.992	0.923	1,753	1.145	0.778
		odds ratio	0.303	1940	2,697	2,518	5,769	3.141	2.177
		Sig.	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***
3	Age owner	coefficient	0.020	-0.046	-0.024	-0.002	0.014	-0.018	-0.035
		odds ratio	1020	0.955	0.976	0.998	1014	0.982	0.965
		Sig.	0.000***	0.000***	0.000***	0.672	0.019**	0.000***	0.000***
4	Gender	coefficient	-1,164	-0.189	0.493	0.401	0.927	0.273	-0.125
		odds ratio	0.312	0.828	1.638	1,493	2,526	1,313	0.882
		Sig.	0.000***	0.001***	0.000***	0.000***	0.000***	0.000***	0.109
5	Lack of Capital	coefficient	1,069	0.245	-0.300	-0.101	-1,013	-0.410	-0.125
		odds ratio	2,913	1,278	0.741	0.904	0.363	0.664	0.883
		Sig.	0.000***	0.000***	0.000***	0.309	0.000***	0.000***	0.138
6	Lack Skilled Workforce	coefficient	0.733	-0.120	-0.330	0.254	0.515	-0.306	0.244
		odds ratio	2082	0887	0.719	1,289	1674	0.737	1,277
		Sig.	0.013**	0.349	0.027**	0.140	0.048**	0.038**	0.119
7	Limited Delivery Services	coefficient	0.205	0.037	-0.068	0.415	1014	0.154	-0.059
		odds ratio	1,228	1038	0.934	1,514	2,757	1.167	0.943
		Sig.	0.486	0821	0.706	0.051*	0.000***	0.375	0.783
Number of Observations			5543	5504	5543	5543	5543	5543	5543
HL test p-value			0.114	0.064	0.093	0931	0.171	0.343	0.293

Instant messaging and social media were most used by e-commerce businesses in Java island. The instant messengers used were WhatsApp, Line, Telegram, and so on, while the social media used were Facebook, Instagram, Twitter, and so on. The technology attached to these two media is a simple medium because it has minimal features to support business. However, social media is relevant for sales because of its ability to improve company performance (Rodriguez et al., 2012). Both of these media are very useful in customer relationship management, where management is very important for assessing customer satisfaction, which helps test service quality, and for getting referrals for future sales (Fraccastoro et al., 2021). In addition, this media is very suitable for SMEs because the costs required are minimal but can have growth potential in national and international markets (Fraccastoro et al., 2021). Communicating through social media is often used by salespeople to emphasize the quality and uniqueness of the company compared to other companies (Appel et al., 2020)

Marketplaces is a feature-rich medium but only ranked third in terms of usage by e-commerce businesses in Java island. A marketplace is a platform or place where sellers and buyers can meet and make buying and selling transactions of goods or services (Selvi Dass & Gapar Md Johar, 2022). Several marketplace brands available in Indonesia include Tokopedia, Shopee, Bukalapak, Gojek, Grab, Blibli, Lazada, Traveloka, Agoda, Pegipegi, and others. This sales medium provides many features that facilitate transactions, such as secure payment systems such as PayPal or credit cards, so that customers can feel calm when making payments. The next feature is customer reviews which allow customers to provide reviews about the products they have purchased so that other customers can read these reviews before deciding to buy the product. Thus, the marketplace functions as a persuasion tool (Fraccastoro et al., 2021). The same thing was expressed by Wu & Qiu (2023), who argued that with customer reviews, potential consumers can directly compare various sellers, brands or products, so it is not surprising that many consumers rely on



consumer reviews to make purchasing decisions. In line with the customer review feature, customer rating feature is a recommendation from previous buyers so that it further adds to the trust of buyers to customers.

Another feature that makes customers comfortable in shopping is search and filter. This feature allows customers to easily search for the desired product and filter search results according to the desired criteria. The next feature is delivery status which gives trust from consumers to sellers.

Website was a medium rarely used by e-commerce entrepreneurs. Website requires the availability of human resources who have high ICT knowledge to build it. Whereas, most e-commerce businesses in Java island, namely as many as 78%, had human resource with a high school education and below. Also, only 8% attended training on using technology for digital marketing.

Based on the binary logistic regression analysis that was carried out, as presented in Table 8, entrepreneur education had a positive relationship with technology adoption in all sales media except instant messengers. The biggest influence from education was on the website, where entrepreneurs with a tertiary education background had 4.3 times higher chances than entrepreneurs with a high school education or below. For the media marketplace, the opportunity was 1.9 times. The educational factor was not related to technology adoption in instant messenger sales media because the media is relatively easy to operate and has become a lifestyle for the community in general, so education did not help increase adoption. The results of this study are in line with Jiménez-Rodríguez et al. (2022). To build a website whose design can be tailored to user needs and is exclusive because it looks unique without any other merchants on it requires a higher education.

Apart from education, high digital competence is essential in building websites. One of the digital competencies is obtained through training. This factor could increase the chances of entrepreneurs adopting technology using website media 5.8 times compared to entrepreneurs who did not participate in training, being able to raise as much as 2.7 times higher in the media marketplace than those who did not participate in training. Digital competence is an urgent matter for adopting technology (Jim & Esteban, 2022). As shown in Table 8, training increases the opportunities for an entrepreneur to adopt technology through digital

media, starting from social media, marketplaces, email to websites.

Table 8 shows that younger age increased entrepreneurs' chances of adopting technology in all sales media, except email. Young age is a productive age that tends to accept technology easily. This study's results align with Trinugroho et al. (2022). In terms of gender, the opportunities for men to adopt technology were higher than for women in all sales media. The chance to increase technology adoption on websites and marketplaces were 2.5 times and 1.6 times higher than women, respectively.

These results contradict the research by Higuera-Castillo et al. (2023), which stated that socio-demographic variables do not affect technology adoption. The study found that men and women were the same in terms of using technology, and the factors that most influenced the use of technology were cost and fear of technology.

Lack of capital related to technology adoption in marketplaces and websites. The greater the lack of capital, the lower the opportunity for entrepreneurs to adopt technology that did require costs on media marketplaces and websites. This is in line with Higuera-Castillo et al. (2023).

### Aspects of Payment Methods

The payment method provided by a business is a unique attraction for consumers with the presence of fintech, which offers many conveniences for customers. A cashless society is a financial technology (fintech) revolution that is in line with the Fourth Industrial Revolution (IR 4.0) and refers to people who make purchase transactions using digital cards or electronic gadgets. The use of fintech generally uses technology such as mobile applications, web platforms, and electronic payment systems to provide financial services efficiently and quickly (Xie & Zhu, 2022). In this study, the scope of fintech was entrepreneurs who facilitated the use of payment methods through internet banking, mobile banking, credit cards, and e-wallets.

The logistic regression analysis results show that the higher the education level and the higher the digital competence, the more excellent the opportunity for entrepreneurs to adopt fintech with a chance of 2.1 and 3.1 times, respectively, compared to entrepreneurs with lower high school education and no training. This result is in line with research Higuera-Castillo et al. (2023). Entrepreneurs with a

high school education or below and who did not receive training tended to have limited technical knowledge and skills, such as the ability to access and operate technological devices or understand how fintech applications work. In addition, they had limited knowledge of the benefits of fintech or were unsure about the safety of fintech due to a lack of experience.

The analysis presented in Table 8 shows that age affected technology adoption in terms of payment methods. These results are in line with Trinugroho et al. (2022), who revealed the results of his research that the characteristics of entrepreneurs, such as younger entrepreneur ages and higher education are significant causes for increasing the probability of micro and small companies to adopt digital technology in terms of online payments.

The younger age increased the chances of entrepreneurs adopting fintech. Men tended to adopt fintech more than women. This is in line with research by Higuera-Castillo et al. (2023) and Venkatesh & Morris (2000) which stated that men tend to be more motivated in achievement-related tasks, such as usability when making adoption decisions, whereas women are highly motivated and influenced by ease of use. Other studies provided consistent results that men are more likely to engage in e-commerce than women (Liébana-Cabanillas et al., 2021). Ong & Lai (2006) found that men have a higher level of IT self-efficiency than women.

Table 8 shows that entrepreneurs who were increasingly short of capital were less likely to adopt fintech. This result is in line with Higuera-Castillo et al. (2023) that cost is a barrier to adopting the technology. Likewise with the variable lack of skilled labor. This result is in line with the research Kurnia et al. (2015) which stated that skilled human resources are needed to develop and maintain technology adoption.

### Aspects of Delivery Methods

The researcher assumed that a non-face-to-face delivery method is a form of technology adoption in the delivery aspect. The non-face-to-face delivery method referred to in this study was through delivery services or by downloading from certain websites, applications, or software. This type of delivery is strongly influenced by aspects of convenience, trust, and security (Castillo et al., 2022)

The logistic regression analysis results show that the only variables related to the adoption of online

delivery were education, training, and age. Table 8 shows that entrepreneurs with higher education were 1.8 more likely to adopt technology in the delivery aspect than entrepreneurs with a high school education and below. These results support the research by Wang et al. (2021), who argued that higher education levels are more likely to use delivery services than those with low education. Digital literacy supported by training increased the chances of technology adoption 2.2 times. This result is in line with Kurnia et al. (2015) that the lack of understanding of entrepreneurs about the benefits of technology adoption has proven to be a barrier for entrepreneurs to adopt. This problem demands more efforts from the government to increase understanding through training (Kurnia et al., 2015).

Table 8 proves that young entrepreneurs preferred to adopt online delivery compared to old entrepreneurs. These results confirm the study by Wang et al. (2021) that age has a negative effect on usage, namely young people tend to use delivery services more than others. Gender was not related to online delivery. These results are contradictory to Wang et al. (2021), which showed that males are 1.413 times more likely to adopt a new grocery delivery than females.

Lack of capital had no effect on the adoption of online delivery. This is contrary to Wang et al. (2021), who mentioned the high cost of shipping discouraged them from adopting online delivery. These findings are also contradictory to Marcucci et al. (2021).

### Research Implication

The results of this study provide important implications for the government in encouraging e-commerce businesses in Indonesia. Moreover, this business is dominated by micro businesses, where most Indonesian households rely on this business for their income (Trinugroho et al., 2022). MSMEs have an important role in the Indonesian economy, especially when there is a crisis; MSMEs were able to get through the monetary crisis in 1998 and during the Covid-19 pandemic. More than that, MSMEs are a means of alleviating poverty.

First, this research reveals that based on the report from Statistics Indonesia, business in Indonesia is still dominated by conventional types of companies, and only 25.92% of businesses are conducting e-commerce activities as of June 30, 2021. However, even businesses that are already doing e-commerce

use the simple technology of media sales side. The same thing happens with payment methods and delivery methods. This is homework for the government to better introduce the benefits of e-commerce so that businesses can "level up" to a larger business scale.

Second, this study reveals that the condition of the e-commerce business in Java is still quite apprehensive due to unprofessional financial management. This is evident from the low awareness of entrepreneurs to prepare financial reports. The government needs to pay more attention to this matter so that businesses can be more focused and more developed.

Finally, the results of this study reveal the magnitude of the influence of education and digital literacy to increase awareness of adopting technology in all aspects, both sales media, payment methods and delivery methods. Digital literacy is important not only for entrepreneurs but also for the workforce, and society in general, whose position is as consumers. Moreover, Indonesia is one of the countries with the largest number of internet users in the world, after China, India, and the United States, namely 204.7 million people (Zulfikar, 2023). The Importance of Education has been confirmed by Jiménez-Rodríguez et al. (2022) that the level of education acts as a factor that can increase digital competence in e-commerce and is helpful for detecting digital fraud practices. In addition, the Education level can minimise risks such as misuse of personal data and breach of privacy, for example, sending email without prior request from the user (Kumar & Roy, 2021).

## CONCLUSION AND SUGGESTION

Shopping through e-commerce has become a lifestyle for today's modern society. Traditional shopping has begun to be abandoned because it is less relevant to technological advances. What's more, the sudden outbreak of the Covid-19 pandemic has ravaged the health system and economy around the world, including Indonesia. The covid pandemic forces everyone to interact physically. Many physical stores were forced to close due to government restrictions. This condition increases people's need to be able to access goods online, so many new e-commerce businesses have sprung up. However, in reality, e-commerce businesses have not been able to experience significant business growth. This can be

seen from e-commerce businesses in Java island, which are still dominated by micro-enterprises with an annual turnover of less than Rp. 300 million in a year with a total of 82.07 percent. This income can actually be increased by optimal use of technology because technology can be used to improve competitiveness and business performance.

A descriptive analysis of e-commerce businesses in Java island shows that they still use simple technology through instant messaging and social media. Technologies with more relevant features to sales, such as marketplaces and websites, are not used optimally. The low technology adoption can also be seen from the payment method, which is still dominated by cash at 77%, and the delivery method by face-to-face at 85%. A descriptive analysis also shows that 78% of e-commerce entrepreneurs in Java island have a high school education or below, and only 8% have attended training on using technology for digital marketing. This is in line with the index score of Indonesia's digital society in 2022, which only reached 37.8 out of a maximum score of 100. E-commerce businesses in Java island are also not good in terms of management. This can be seen from the few entrepreneurs who compile financial reports, only 25%.

This research attempts to discuss how e-commerce businesses in Java adopt technology in a comprehensive manner, both from the aspects of sales media, payment methods, and delivery methods. This research also combines the acceptance of technology by entrepreneurs as well as inhibiting factors. For this, logistic regression analysis was developed to examine the factors that influence technology adoption by e-commerce businesses in Java. The results show that the variables of education, training, age, gender, lack of capital, and lack of skilled labor tend to be related to technology adoption. The variable delivery service limitations tend not to be related to technology adoption.

Digital literacy is a key factor in the diffusion of innovations. To increase the digital competence of e-commerce entrepreneurs, the government needs to launch education that encourages the use of critical, safe and sustainable digital skills related to e-commerce in primary and secondary schools. All citizens will be able to interact with a technology-mediated environment where transactions and e-commerce are a regular occurrence after completing the required part of their education. Without these

skills, the digital divide will widen even more for the less educated and disadvantaged. As previously said, COVID-19 has significantly accelerated the growth of e-commerce, making it one of the safest ways to make transactions during the lockdown. To do this, citizens must develop their digital skills.

This study has limitations in terms of the data used because it is one point in time (cross-section), so it is impossible to observe trends regarding technology adoption along with dynamic phenomenon. In addition, this study does not discuss other important factors in technology adoption, such as organisational culture factors and data security factors in electronic commerce technology. Future research can broaden the discussion by adding these variables and adding time references so that time comparisons can be discussed in full along with the development of technology.

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