



## BACKGROUND NOTE

# Business Innovation and E-Commerce in Indonesia

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# BUSINESS INNOVATION AND E-COMMERCE IN INDONESIA

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## A. Introduction

Innovation is the important source of economic growth. Indonesia ranks 27th among the 34 upper middle-income group economies (Global Innovation Index 2021). Among Southeast Asia, East Asia, and Oceania countries, Indonesia ranks 14th among the 17 economies, and Indonesia ranks 87th overall among the 132 economies featured in the Global Innovation Index (GII) 2021. Relative to gross domestic product, Indonesia's innovations performance is at expectations for its level of development. The innovation level of Indonesia is not only very low in 2021, but also declined from 2019 rank at 85th (WIPO 2021). Therefore the level of innovations of Indonesia needs to be addressed by businesses and the government for higher and sustained economic growth. Among the seven pillars of innovation, the weaknesses of GII score are in business sophistication (110th), institutions (107th), human capital and research (91st), and creative outputs (91st), and the strengths are in knowledge and technology output (74th), infrastructure (68th), and the market sophistication (57th).

The spread of digital technology all over the world provides opportunities for businesses to innovate more. Digital technology transforms economy of a country rapidly. Although in the sub-pillar of GII on information and communication technology (ICT) Indonesia ranks 80th, the strength of market sophistication can help the development of business in Indonesia. In this circumstance, Indonesia is a country that has a huge potential for the development of digital technology. From Eka (2018) there is a research from Google-Temasek that the large number of internet users in Indonesia is the key support to Indonesia's economy. Digital technology development in economic and business sectors in Indonesia by Das, K., et.al. (2018) show that:

- (i) Indonesia is estimated to have an online trading market of \$5 billion for formal online trading, and more than \$3 billion for informal online trading.
- (ii) Indonesia is estimated to have 30 million online shoppers in 2017 with a total population of about 260 million.

- (iii) By 2025, Indonesia's digital economy is expected to create an additional 3.7 million jobs.
- (iv) Indonesia can generate up to 80% or higher revenue growth from small and medium-sized enterprises (SMEs). By increasing broadband penetration rates and using digital technology by SMEs, gross domestic product will grow by an additional 2% per year.

The start-ups, scale-ups, and sustainability of existing businesses in the midst of a rapidly changing environment require a strong and tenacious entrepreneurs. One of the important abilities for environmental changes adaptation is the ability to innovate, and the most recent innovation is the development of e-commerce which far exceeds the previous period.

The general aim of this research is to analyze business innovation in Indonesia and the development of e-commerce. The analysis is carried out at the national macro level, based on the aggregation of information on companies data from Statistics Indonesia. The specific objectives of this research are to analyze (i) the company's status on innovations, (ii) the type and performance of their innovations, and (iii) the development of digital technology and e-commerce.

This research can provide benefits for (i) policy makers to formulate policies that support national innovation ecosystem, (ii) businesses to understand their own ecosystem of innovation landscape, and (iii) researchers to open the more specific and micro research on business innovation and e-commerce as the impact of digital technology changes.

## **B. Innovation, Digital Technology, and E-Commerce**

### **1. Innovations and Its Determinants**

In a highly competitive and global economy, innovation is considered a key factor for business success and, with innovation, business will have a clear future opportunity (Rajapathirana and Hui 2018). Businesses can maintain their positions and improve their levels of profits by innovation (Hu and Hsu 2008; Kaminski, de Oliveira, and Lopes 2008). This should make businesses realize the importance of understanding innovation competencies that are relevant as drivers for economic growth under the global change (Ko and Lu 2010). Activities on innovation are all scientific, technological, organizational, financial, and commercial steps that will lead to the implementation of innovations. Research and development (R&D) is also included but not directly related to the development of innovation (OECD 2005). Implementation of innovation can significantly improve products (goods or services), or processes or a new marketing method or a new organizational method in business practices, workplace organizations, or external relations. The framework in Oslo Manual represents an integration of insight from various firm-

based theories of innovation (OECD 2005). Innovation is defined as a new product or process or improvement of products/processes that are significantly different from those produced/owned by the previous company in the form of products that have been introduced to the market or processes that have been used by the company. Many studies have been conducted to explore the factors that determine the level of innovation of a country or region. This study explores the factors that determine innovations at the industry level;

- (i) Market structure determines innovations. Market structure, as a determinant of innovation based on a study in the United States on innovation at the industry-level, showed a large role for market structure on innovation, namely the positive effect of market concentration on innovation (Boer 2015). Moreover, in his research, Capleton concludes that a market structure with low concentration indicates an increase in innovation.
- (ii) Firms age determines innovation level of industry. Entrant or new firms tend to present the highest probability of innovation, while the oldest firms tend to show lower innovative probabilities. Intermediate age firms present a high probability of innovation (Huergo and Jaumandreu 2004). But the other research shows uncertainty. Firm age does not have any relationship with intellectual capital and innovation capability (Noordin and Mohtar 2014).
- (iii) Source of investment determines innovation level of industry. Acceptance of foreign direct investment by a country is based on technology transfer or innovation spillover. Foreign direct investment in the People's Republic of China benefited innovation activity in the host country via spillover channels such as reverse engineering, skilled labor turnovers, demonstration effects, and supplier–customer relationships, which resulted in increasing number of domestic patent applications in the People's Republic of China (Cheung and Ping 2004). However, the results are also potentially ambiguous when referring to SMEs in Germany. From a large sample of German SME firms, foreign acquisitions have a large negative impact on the propensity to perform innovation activities and a negative impact on average R&D expenditures in innovative firms (Stiebale and Reize 2011).
- (iv) Gender diversity determines the level of industry innovation. Female directors have a significant impact on board inputs and firm outcomes, in the United States sample firms (Adams and Ferreira 2009). Also, gender diversity has a positive influence on innovation, which reflects the increased presence of women, especially in new ventures (Dai, Byun, and Ding 2018).

## **2. Digital Technology Innovations and E-Commerce**

As part of ICT, digital technology affects all areas of production and even many aspects of social and political life, with the emergence of digital interactions and social media (Nathan and Ahmed 2018). ICT has been considered successful in encouraging technological innovation in the collection, storage, processing, transmission, and presentation of information that is very dynamic and continues to grow (Miah and Omar 2012). Digitization is defined as the adoption of digital technologies to sustain new value creation (Rymaszewska et al. 2017), changes the approaches and strategies that firms adopt to develop new products (Xie et al. 2016), and firms need to expand their knowledge with the latest technological solutions (Ceipek et al. 2021).

Electronic commerce (e-commerce), based on the Organisation for Economic Co-operation and Development (OECD) 2009, is the sale or purchase of goods and services, which are carried out through computer networks with methods that are specifically designed for the purpose of receiving or placing orders, although payment and delivery of the main goods and services do not have to be done online. E-commerce transactions can occur between businesses, households, individuals, governments, and other private or public organizations. Including: ordering through website pages, extranets, and Electronic Data Interchange (EDI), e-mail, social media (Facebook, Instagram, etc), and instant messaging (Whatsapp, Line, and etc).

Digital technology and e-commerce can be effective ways to collect large amounts of data about customers, thereby stimulating innovation and differentiation in the market based on extensive analysis (Rosenzweig 2009). Given the benefits of digitization, innovative digital solutions are very important for various business functions such as marketing, customer service, human resource management, logistics, and production. Digital innovation can be conceptualized as an innovative information technology solution that integrates digital technology to support business digitization such as banking, health care, manufacturing, and retail (Khin and Ho 2019). E-commerce was built on traditional commerce structures by adding the flexibility through digital technology innovations. This facilitates improvements in operations that lead to substantial cost savings as well as increase competitiveness and efficiency through redesign of traditional businesses (Albăstroiu 2007). E-commerce is an industry based on ICT development (Cui et al. 2017), with the expansion of the internet (Jaković et al. 2021). The internet and its low cost of use enable the interconnection of new and existing ICTs, and offer businesses and consumers powerful information systems and new forms of communication. This allows buyers and sellers to come together in a more efficient way and creates new markets and opportunities for reorganizing economic processes. It is also changing the way products are customized, distributed, and

exchanged and how businesses and consumers search for and consume products (Coppel 2000). Further, e-commerce can encourage companies to provide not only standard and traditional products, but also unique and limited editions, thereby further enhancing the differentiation of their products from competitors as well as their overall level of innovation performance (Koellinger 2008; Macchion et al. 2017). The implementation of e-commerce requires a well-developed strategy which is decided by the management of the company. This includes preparing technological resources, reliable human resources in information technology, and building information systems to manage company operations (Pranata and Darma 2014; Kurniawati, Al Siddiq, Idris 2020). Some general benefits of e-commerce include:

- (i) Get new customers. Business can get new customers both from the domestic market As well as foreign markets (Hamill da Gregory 1997; Hoffman and Novak 2000).
- (ii) Attract consumers to stay afloat. Customers are expected not to switch to competitors. Referring to a study in the banking industry, the existence of e-banking services did not switch to the other banks, and banks will also attract new customers who come from banks with old technology (Daniel and Storey 1997).
- (iii) Improve service quality. With e-commerce, it is possible for companies to improve services by conducting more personal interactions to provide information according to what the customers want. E-commerce can be useful in improving the quality of service (Gosh 1998).
- (iv) Serve customers without time limit. Customers can make transactions and take advantage of a company's services without having to be tied to the closing or opening times of the company (Daniel and Storey 1997).

## **C. Analysis**

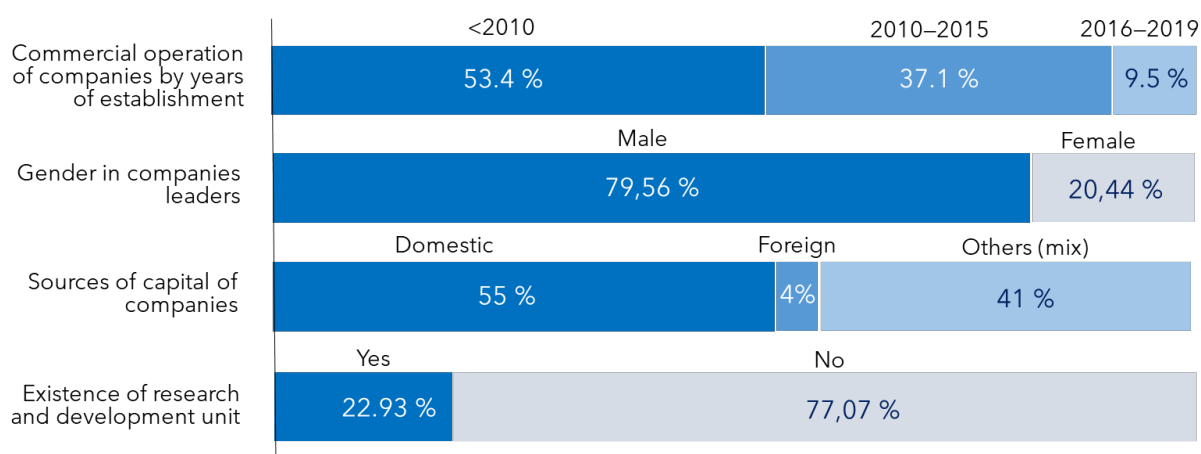
### **1. The Innovation Level of Companies in Indonesia**

The analysis of industry innovation level of Indonesia is based on data from Statistics Indonesia, which conducted a survey on 7,012 samples of medium-sized and large-sized companies from 212 districts of 34 provinces in 2019 while the data for year 2020 was based on 7,773 samples from 252 districts. The difference in the 2020 survey is that it excluded the accomodation and food services sector. The composition of sample sectors is based on population companies.

In 2019, the largest sample was the wholesale and retail trade, repair of motor vehicles and motorcycles sector (42.76%), followed by the manufacturing sector (10.52%), finance and

insurance sector (8.51%), construction sector (8.35%), and the remaining 30% samples are from the other 12 sectors. As many as 53.4% of companies were founded before 2010, then 37.1% were founded in 2010–2015, and the rest 9.5% were infant founded in 2016–2019. Among these companies, 79.56% are led by male executives, about 55% are domestic investment companies, 41% are companies under other categories, and 4% are foreign investment companies. Only 22.93% of companies has R&D unit.

**Figure 1: Profile of Sample Companies in 2019 (%)**



Source: Statistics Indonesia.

Of the entire samples from Statistics Indonesia, only 32.92% implemented innovation commercially in 2019. This is a small fraction because the medium-sized and large-sized companies potentially are able to innovate. As many as 41.42% of the innovation-implementing companies are from the wholesale and retail trade, repair of motor vehicles and motorcycles. Finance and insurance (14.2%), manufacturing (9.51%), accomodation and food services (7.02%), transport and storage (5.48%), and construction (4.89%); and the remaining 27.2% innovations came from 11 other sectors. Details are in Table 1.

**Table 1: Distribution and Proportion of Innovating Companies in 2019**

Sector	Samples Distribution / Economic Structure (%)	Distribution of Companies (%)
Mining and quarrying	0.54	0.19
Manufacturing	10.52	9.51
Electricity and gas	0.39	0.55
Water supply, sewerage, waste management, and remediation	0.40	0.32
Construction	8.35	4.89

Sector	Samples Distribution / Economic Structure (%)	Distribution of Companies (%)
Wholesale and retail trade, repair of motor vehicles and motorcycles	42.76	41.42
Transport and storage	6.35	5.48
Accommodation and food services	4.84	7.02
Financial and insurance	8.51	14.20
Real estate	1.95	1.85
Professional, scientific, and technical	2.63	1.99
Rental, leasing, employment placement, travel agent, and related	4.56	2.76
Education	2.49	3.21
Human health and social work	1.13	1.44
Art, entertainment, and recreation	0.64	0.55
Other services	1.39	1.31
<b>Total</b>	<b>100.00</b>	<b>100.00</b>

Source: Statistics Indonesia (2020).

By comparing with the survey results of 2020, during the coronavirus disease (COVID-19) pandemic, it seemed the pandemic affected the level of company innovation. In 2019, companies that innovated were about 32%, but in 2020 it fell to 29.7%. In general, although there has been a decline, several business sectors have actually increased the level of innovation. The biggest innovation increase occurred in education sector, followed by the sectors of human health and social work, transport and warehousing, services, mining and quarrying, water supply, and sewerage and waste processing. The biggest decline in innovation occurred in the sectors of real estate, art, recreation and entertainment, electricity and gas, and ICT.

By using sample distribution data as an indicator of market structure and distribution of innovating companies, the relationship between the two can be analyzed. Based on the data of 2019 as described above, we can analyze the relation of innovation intensity with the economic structure. The results of the regression between economic structure with level of innovations are:

$$Y = 0.1822 + 0.969 X \quad (1)$$

(0.733)    (0.000)\*\* p value

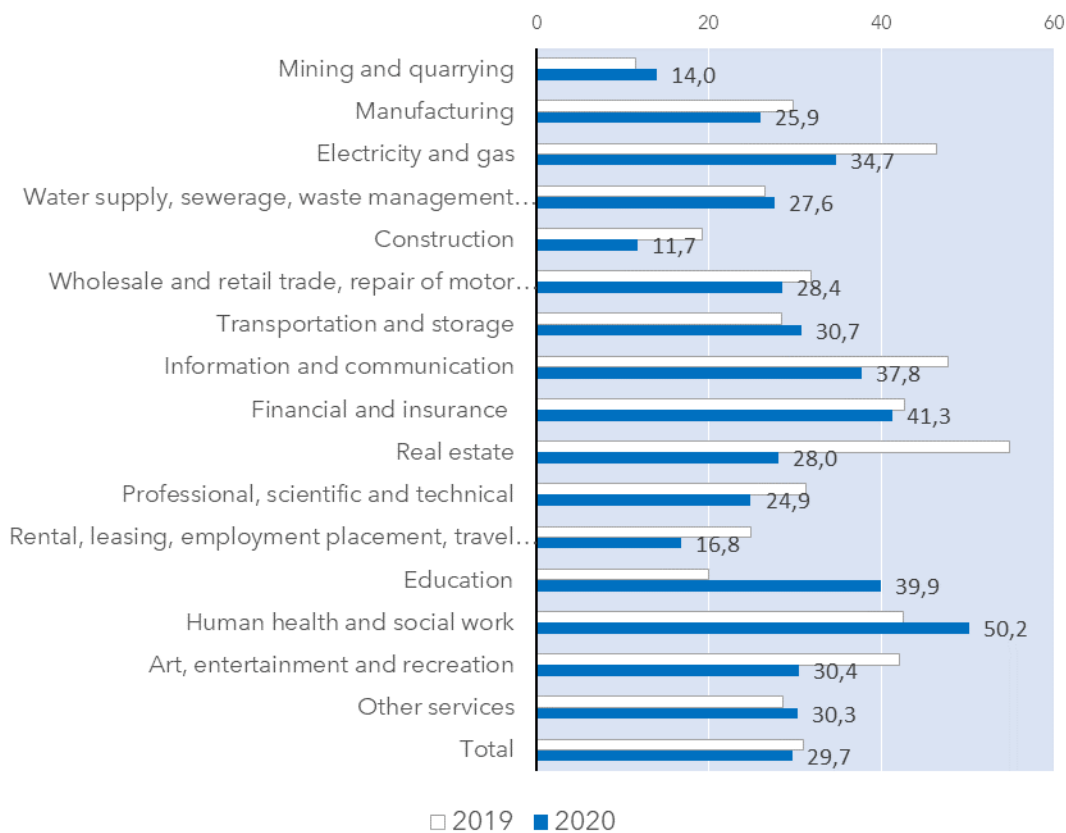
$$R^2 = 0.96$$

Where:

Y = innovating companies distribution by sectors (%)  
X = samples distribution by sectors (%)



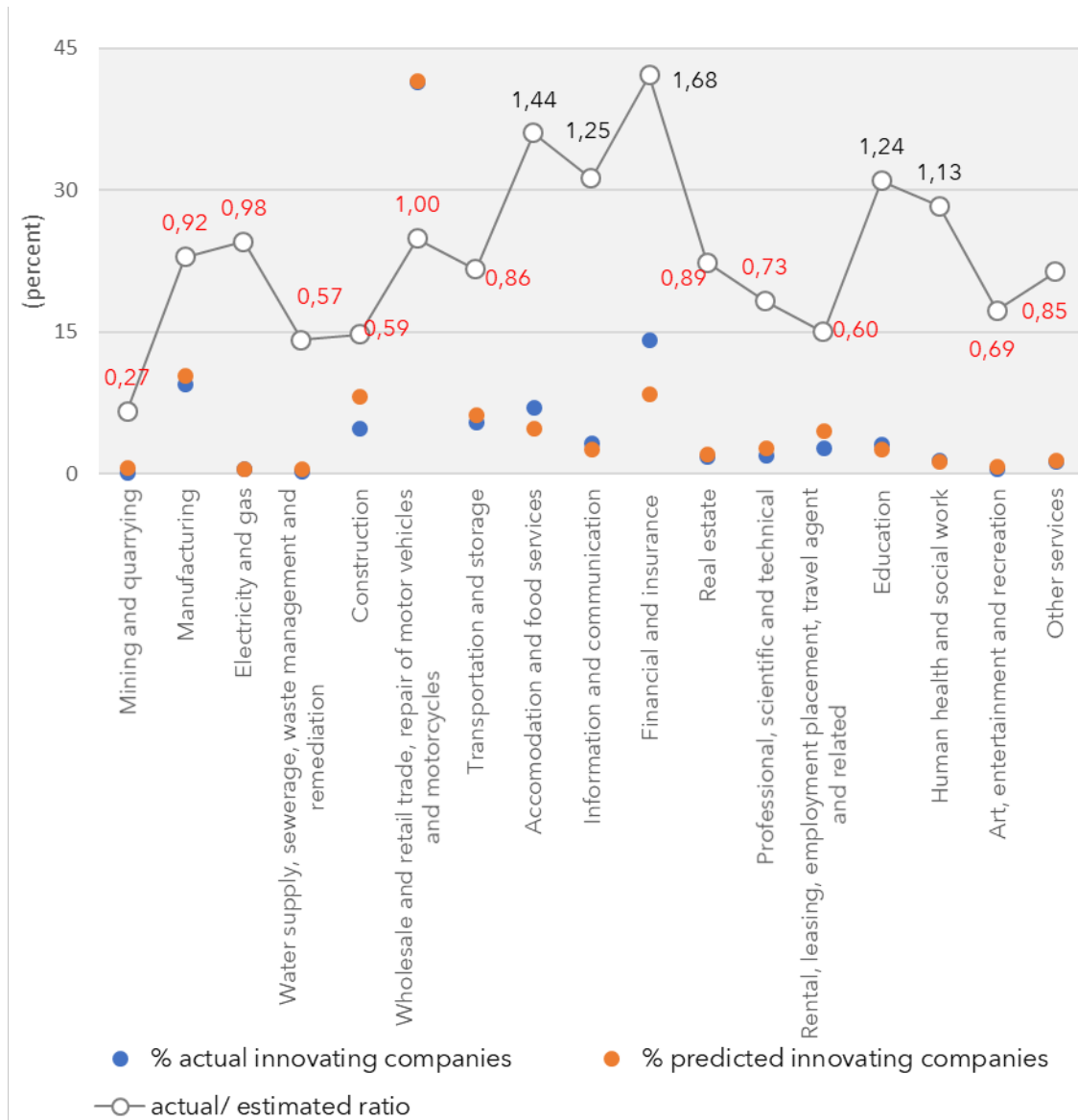
**Figure 2: Percentage of Innovating Companies in 2019 and 2020 by Sectors**



Source: Statistics Indonesia.

Based on equation (1), it appears that the economic structure is highly significant in determining the level of innovation. Based on the equation, we can calculate the level of innovation of all economic sectors. If the actual data is greater than the estimated data ( $> 1$ ), it can be said that the sector has a high level of innovation, and vice versa. Figure 4 indicates that the ratio of the financial and insurance sector is 1.68 as a high level of innovation, followed by other sectors such as accomodation and food services (1.44), ICT (1.25), education (1.24), and human health and social work (1.13). A total of 12 other sectors are classified as having a low level of innovation implementation. The mining and quarrying sector is the lowest (0.27) in application of innovation.

**Figure 3: Level of Innovation by Sectors in 2019 (%)**



Source: Statistics Indonesia (data processed).

In addition to the economic structure that shape' the company's level of innovation described above, it is likely that there are other contributing factors, such as the gender of the executive' the company's investment sources, the existence of an innovation division, and the age of the company. The results of the regression on these factors are:

$$I = 10.604 + 0.200 M + 0.706 F \quad (2)$$

(0.087)\*      (0.064)\*

$$\begin{aligned} F\text{-test} &= 0.000*** \\ R^2 &= 0.962 \end{aligned}$$

$$I = -7.724 + 0.876 DI - 0.055 FI - 0.321OI \quad (3)$$

(0.0003)\*\*\*      (0.920)      (0.143)

$$\begin{aligned} F\text{-test} &= 0.000*** \\ R^2 &= 0.975 \end{aligned}$$

$$I = 0.114 + 1.434 ID \quad (4)$$

(0.008)\*\*\*

$$R^2 = 0.993$$

$$I = 14.156 + 0.171 X1 + 1.318 X2 - 3.009 X3 \quad (5)$$

(0.216)      (0.019)\*\*      (0.072)\*

$$\begin{aligned} F\text{-test} &= 0.000*** \\ R^2 &= 0.968 \end{aligned}$$

Where:

- I = innovating companies
- M = male executive
- F = female executive
- DI = domestic investment companies
- FI = foreign investment companies
- OI = other types of investment companies
- ID = existence of innovation division
- X1 = companies establishment before 2010
- X2 = companies establishment in 2010–2015
- X2 = companies establishment in 2016–2019

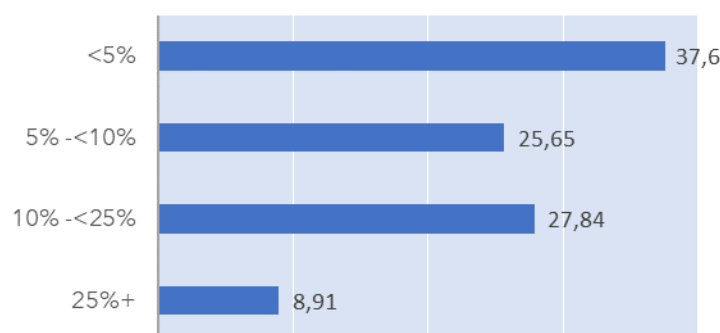
The level of innovation of companies are quite significantly determined by the gender category of company executives. In general, although the percentage of executives is dominated by men, companies led by female executives have a higher level of significance in innovations. The level of innovation of companies, based on source of their investment, shows that domestic investment companies are significantly more innovative than companies with foreign innovation and other forms of investment. Other investment is the company has not/never/is in the process of applying for capital facilities. Companies that have an innovation division are very significant in bringing up innovations. Based on the period of company formation, companies founded in 2010–2015 significantly innovate, compared to companies founded before 2010, and infant companies established in 2016–2019. Old companies seem to be with business stability, so they are not

encouraged to innovate. Infant companies do not innovate because they are relatively new or their new existence has brought a certain character of innovation. Companies that were founded in 2010–2015 are the middle age group basically need to adapt to their environment because of higher competition and/or need to scale up their business.

Commitment to innovation can be measured by the value of the company's spending on innovation. In medium-sized and large-sized companies, the opportunity to conduct research and development is naturally greater than in small companies. This expenditure can be estimated through the costs specifically budgeted for the innovation unit/division during 2019. The percentage of expenditure on innovation is the portion of expenditure on innovation of the total expenditure of the business/company.

In 2020, company spending on innovation is less than 5% of the company's total expenditure, which is 37.6% of companies. A total of 27.84% of companies spend on innovation budgets 10%–25% of the company's total expenditures, 25.65% of companies spend on innovation budgets of 5%–10% of the company's total expenditures, and about 8.91% of companies spend on innovation more than 25% of their total expenditures.

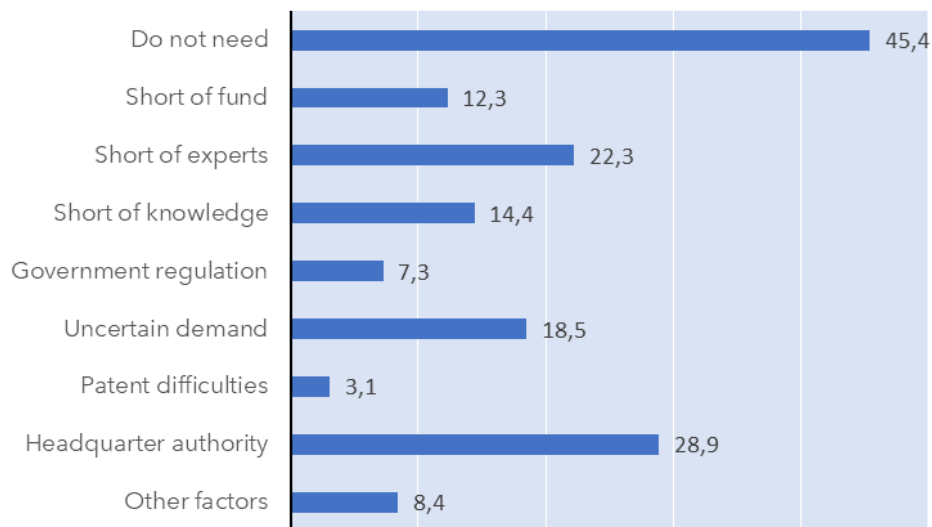
**Figure 4: The Expenditure for Innovation in 2020 (%)**



Source: Statistics Indonesia.

The only few companies that conduct innovation are caused by various factors. The biggest factor is that they do not need innovation (45.4%), no authority to innovate because innovation is centralized to the head office (28.9%), lack of experts (22.3%), uncertainty of demand (18.5%), and other smaller factors. In the midst of a rapidly changing business environment, because of advances in technology, business models and business competition, the lack of innovation is quite surprising. Even delays in adaptation to environmental changes can threaten the sustainability of the business.

**Figure 5: Obstacles of Conducting Innovation in 2020 (%)**



Source: Statistics Indonesia.

## **2. Types of Innovation**

The innovation level of companies in Indonesia analysis is based on data from Statistics Indonesia, 2019 and 2020 of medium-sized and large-sized companies in two general types of innovation, which consist of product innovation and process innovation. Process innovation is a significant change related to methods in the production process of new goods and services that are significantly different from the previous ones, new methods of delivery or distribution of goods and services and logistics that are significantly different from the previous ones, new marketing and sales methods that are significantly different from the previous ones, methods of new ICT systems, new administration and management, development of new products and business processes that are significantly different from the previous, or methods of producing or delivering goods and services.

The percentage of companies that conducted product innovation and process innovation are balanced relatively. During the COVID-19 pandemic, the level of innovation has decreased. Product innovation that was conducted by 26.52% of companies in 2019 decreased to 23.41% in 2020. Process innovation that was conducted by 26.64% of companies in 2019 decreased to 23.9% in 2020. Decline of product innovations is mostly in the sectors of electricity and gas, finance and insurance, and construction. Decline of process innovation mostly occurred in the sectors of finance and insurance, electricity and gas, and ICT.

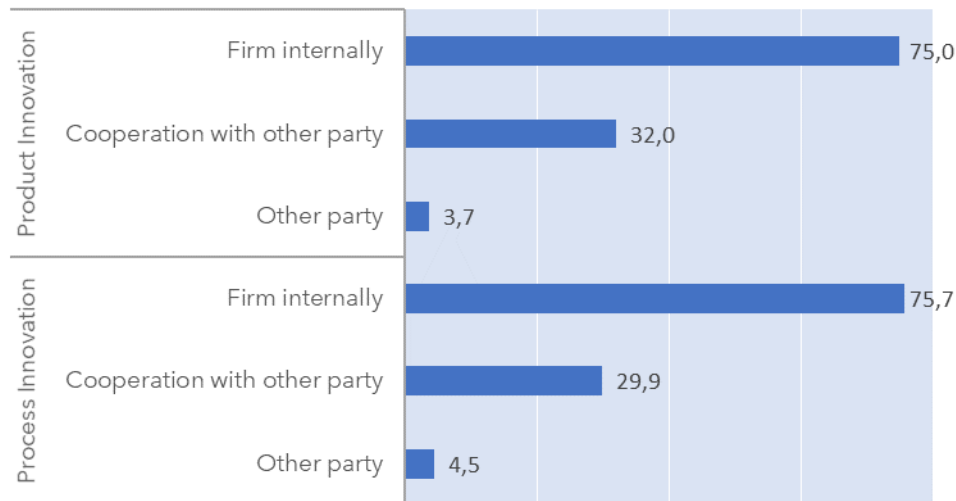
**Table 2: Types of Innovation of Companies in 2019–2020 (%)**

Sectors	Product Innovation			Process Innovation		
	2019	2020	Changes	2019	2020	Changes
Mining and quarrying	6.86	7.22	0.36	9.31	13.79	4.48
Manufacturing	25.65	20.73	-4.92	22.67	19.14	-3.53
Electricity and gas	39.35	28.33	-11.02	38.88	30.23	-8.65
Water supply, sewerage, waste management, and remediation	19.56	18.48	-1.08	24.02	24.68	0.66
Construction	16.05	8.21	-7.84	14.55	10.21	-4.34
Wholesale and retail trade, repair of motor vehicles and motorcycles	26.15	20.83	-5.32	26.54	23.32	-3.22
Transport and storage	24.45	23.54	-0.91	25.08	25.72	0.64
Information and communication	35.44	31.83	-3.61	36.24	29.03	-7.21
Financial and insurance	45.85	35.55	-10.30	44.86	33.75	-11.11
Real estate	25.39	21.37	-4.02	25.18	21.81	-3.37
Professional, scientific, and technical	20.26	21.52	1.26	22.97	20.00	-2.97
Rental, leasing, employment placement, travel agent, and related	14.86	12.18	-2.68	18.63	14.47	-4.16
Education	33.63	30.75	-2.88	36.20	32.42	-3.78
Human health and social work	33.18	40.13	6.95	37.54	40.72	3.18
Art, entertainment, and recreation	23.02	24.78	1.76	23.95	23.96	0.01
Other services	23.63	26.18	2.55	24.87	22.63	-2.24
<b>Total</b>	<b>26.52</b>	<b>23.41</b>	<b>-3.11</b>	<b>26.64</b>	<b>23.90</b>	<b>-2.74</b>

Source: Statistics Indonesia (2020, 2021).

In carrying out product and process innovation, there are companies that conducted their own innovation unit, cooperated with other parties, or are fully carried out by other parties. Data of 2020 shows that, in general, companies do their own product innovation (75%), and about 30% by collaboration with other parties. Other parties usually carry out specific sectors outside the company's competence. There are relatively few innovations that are entirely carried out by other parties, because of the business strategy.

**Figure 6: Pattern in Conducting Innovation in 2020 (%)**



Source: Statistics Indonesia.

### 3. Benefits of Innovation Implementation

Innovative companies expect to be rewarded by significant benefits. In medium-sized and large-sized companies that have implemented product innovation and process innovation, it is necessary to know the perceived benefits. These benefits are identified in the form of revenue increase, cost efficiency, competitiveness, and customer service increase, as well as other forms of benefits. The various benefits of implementing innovation in each sector are in Table 2. The benefits of innovation implementation, which is most widely felt, are in customer service increase (69.2%), then in competitiveness increase (62.14%), revenue increase (61.81%), and in cost efficiency (43.1%). Companies that benefit from innovation appear to vary across sectors of the economy.

**Table 3: Benefits of Innovations by Sectors in 2019**

Sectors	Revenue Increase	Cost Efficiency	Competitiveness Increase	Customer Service Increase	Other Benefit
Mining and quarrying	42,44	55,61	46,83	63,41	3,9
Manufacturing	60,02	48,96	67,31	53,48	0,24
Electricity and gas	64,44	51,09	35,23	73,46	1,67
Water supply, sewerage, waste management, and remediation	58.97	52.71	43.59	78.35	-
Construction	58.59	68.26	52.65	56.49	-
Wholesale and retail trade, repair of motor vehicles, and motorcycles	64.94	38.77	65.51	67.98	0.42
Transport and storage	61.81	41.50	62.58	74.18	-

Sectors	Revenue Increase	Cost Efficiency	Competitiveness Increase	Customer Service Increase	Other Benefit
Accommodation and food services	71.90	35.25	58.49	71.01	0.49
Information and communications	60.67	38.09	63.66	77.56	0.47
Financial and insurance	62.12	48.65	60.07	84.31	-
Real estate	59.20	37.55	55.31	50.20	0.98
Professional, scientific, and technical	53.84	37.39	51.23	63.30	-
Rental, leasing, employment placement, travel agent, and related	57.00	57.89	55.78	71.43	-
Education	34.83	39.17	64.38	64.63	1.19
Human health and social work	45,55	42.15	51.80	93.69	-
Art, entertainment, and recreation	72.49	26.69	57.83	56.67	-
Other services	41.49	40.18	54.84	71.37	0.07
<b>Total</b>	<b>61.81</b>	<b>43.10</b>	<b>62.14</b>	<b>69.20</b>	<b>0.32</b>

Source: Statistics Indonesia (2020).

The significance of various forms of perceived benefits with the application of product innovation and process innovation are indicated in equations (6)–(10).

$$Y1 = -4.49 + 0.545X1 + 0.244X2 \quad (6)$$

(0.007)\*\*\*      (0.178)

$$F\text{-test} = 0.000***$$

$$R^2 = 0.998$$

$$Y2 = 4.-4 + 0.693X1 - 0.213X2 \quad (7)$$

(0.053)\*      (0.525)

$$F\text{-test} = 0.000***$$

$$R^2 = 0.982$$

$$Y3 = -4.196 + 0.263X1 + 0.529X2 \quad (8)$$

(0.147)      (0.008)\*\*\*

$$F\text{-test} = 0.000***$$

$$R^2 = 0.998$$

$$Y4 = 1.023 + 0.115X1 + 0.718X2 \quad (9)$$

(0.798)      (0.123)



$$F\text{-test} = 0.000^{***}$$

$$R^2 = 0.989$$

$$Y5 = 0.188 - 0.009X1 + 0.014X2 \quad (10)$$

(0.637)      (0.458)

$$F\text{-test} = 0.000^{***}$$

$$R^2 = 0.652$$

$$* = p < 0.10; \quad ** = p < 0.05; \quad *** = p < 0.01$$

Where:

Y1 = revenue increase

Y2 = cost efficiency

Y3 = competitiveness increase

Y4 = customer service increase

Y5 = other benefits of innovation

X1 = production innovation

X2 = process innovation

Based on the above equation, product innovation provides very significant benefits to revenue increase, and to cost efficiency, but not significant for other forms of benefits. Process innovation provides very significant benefits to the competitiveness increase only, but does not significantly provide other forms of benefits.

Further details on types of process innovations may result in detailed effects on innovation performance. The types of process innovations consist of (i) production methods, (ii) delivery and distribution methods, (iii) marketing and sales methods, (iv) new system of information and communications, (v) new method in administration and management, and (vi) new business process. The regression results are summarized in the following equations:

$$Y1 = 3.477 + 0.000X1 + 0.503X2 + 0.170X3 - 0.536X4 - 0.092X5 + 1.883X6 \quad (11)$$

(0.999)    (0.000)\*\*\*    (0.248)    (0.077)\*    (0.762)    (0.000)\*\*\*

$$F\text{-test} = 0.000^{***}$$

$$R^2 = 0.999$$

$$-Y3 = -2.380 - 0.400X1 + 0.454X2 + 0.410X3 - 0.149X4 + 0.695X5 + 1.104X6 \quad (13)$$

(0.015)\*\*    (0.004)\*\*\*    (0.050)\*\*    (0.688)    (0.108)    (0.005)\*\*\*

$$F\text{-test} = 0.000^{***}$$

$$R^2 = 0.998$$

$$Y4 = 0.652 + 0.486X_1 - 0.196X_2 - 0.119X_3 - 0.113X_4 - 0.028X_5 + 1.642X_6 \quad (14)$$

(0.002)\*\*\* (0.092)\* (0.471) (0.724) (0.935) (0.000)\*\*\*

$$F\text{-test} = 0.000***$$

$$R^2 = 0.999$$

Where:

- X1 = production process
- X2 = delivery and distribution process
- X3 = marketing and sales process
- X4 = new system of information and communications
- X5 = new process in administration and management
- X6 = new business process

**Table 4: Summary of Regression on Innovations and Its Benefit in 2019**

		Benefits of Innovation			
		Revenue Increase	Cost Efficiency	Competitiveness Increase	Customer Service Increase
Types of Process Innovation	Production process			** (-)	***
	Delivery and distribution process	***		***	*
	Marketing and sales process			**	
	New system of information and communications	* (-)			
	New process in administration and management				
	New business process	***	**	***	***

\* = p < 0.10; \*\* = p < 0.05 ; \*\*\* = p < 0.01.

Source: Author's calculations.

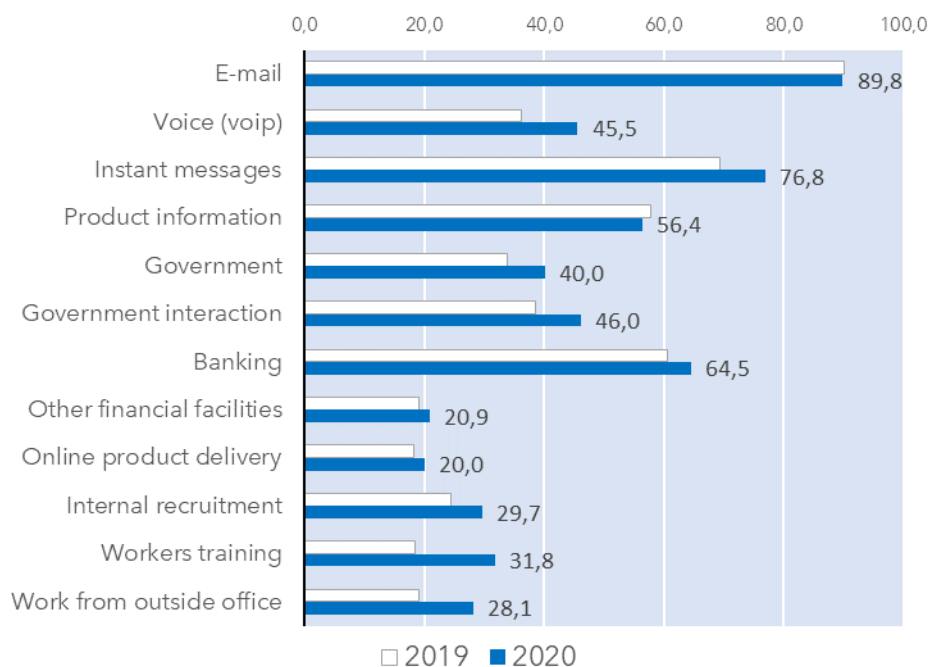
Innovation in new business process is the type of process innovation that significantly contributed to all kinds of benefit, such as revenue increase, cost efficiency, competitiveness increase, and customer service increase. Innovation in delivery and distribution process is the type of process innovation that significantly contributed to revenue increase, competitiveness increase, and customer service increase. Marketing and sales process innovation only contributed significantly on competitiveness increase. Contradictive results are of production process innovation and new system of information and communications. Production process innovation significantly decreased competitiveness, but at the same time increase customer service. New system of information and communication innovation significantly decreased revenue. In general, new business process innovation and delivery and distribution process innovation are the significant choices for higher performance of companies.

#### 4. Digital Technology and E-Commerce

In the Asian Index of Digital Entrepreneurship Systems (AIDES) 2021, Indonesia's digital entrepreneurship index is 20.4 and is categorized as laggard, at 71st of the 113 Asian countries. The pillars of the index are the strength in network and support (0.30), human capital (0.29), physical infrastructure (0.24), knowledge creation and dissemination (0.22) and the formal institutions, regulation and taxation (0.23), finance (0.22), market conditions (0.15), and culture and informal institutions (0.10). This digital entrepreneurship is relatively low, but at the same time some unicorns and decacorn start-up grow in Indonesia. Related to digital entrepreneurship in Indonesia, the analysis of digital technology adoption and e-commerce is based on data from Statistics Indonesia, which conducted a survey of 17,038 sample companies using internet in 2019 and 11,928 samples companies in 2020.

Digital technology is part of the ICT sector. The type of digital technology that is widely used in Indonesia is the internet. During the COVID-19 pandemic, there was an increase of internet use by 8.99%. In the medium-sized and large-sized companies, there are different types of use, with different levels of potential business impact. The most common use is for email, instant messaging, banking, and product information. During COVID-19 in 2020, the highest increase of internet use were for workers' training, voice for communication, work from outside the office, instant messaging, and interactions with the government.

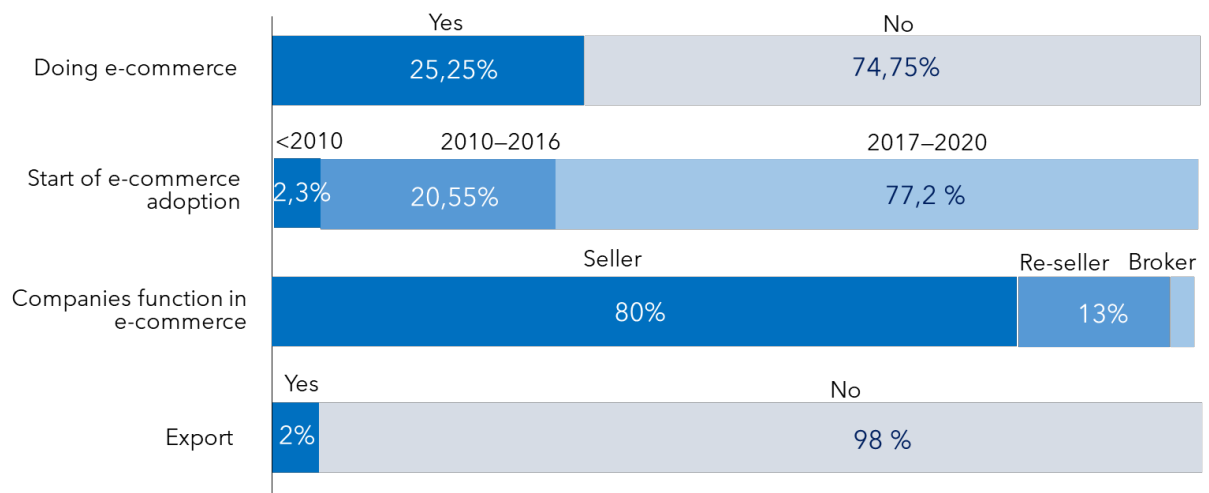
**Figure 7: The Use of Internet in 2019–2020 (%)**



Source: Statistics Indonesia.

In 2020, as many as 25.25% implemented e-commerce. Companies that have implemented e-commerce in less than 5 years are 77.2%. About 20% have implemented it in the last 10 years and only 2.3% have implemented it for more than 10 years. This means that e-commerce is still relatively new in Indonesia, and there are many more who have not yet adopted e-commerce. As many as 80% of surveyed e-commerce companies were sellers of their own products, 13% reseller, and the rest are brokers of sellers. Mostly, the market orientation of e-commerce is domestic, with only 2% are exporters of their products.

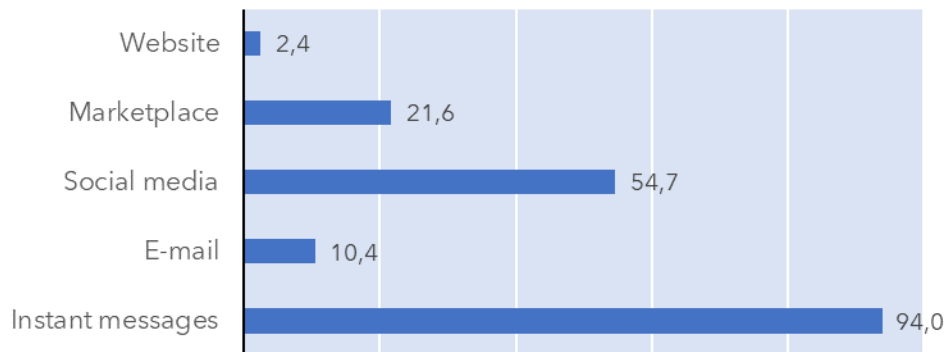
**Figure 8: E-Commerce Adoption and Use in 2020 (%)**



Source: Statistics Indonesia.

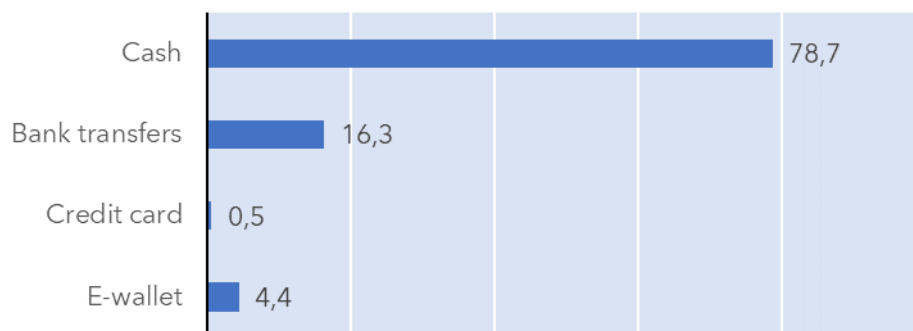
The media that e-commerce commonly use are instant messaging (94%), and social media (54.7%). Only 21.6% joined the established marketplace. In terms of payment, cash payments are very dominant (78.7%), bank transfers (16.3%), and digital money such as e-wallet (4.4%). The dominant choice of e-commerce media and the cash payment method indicate that e-commerce adoption in Indonesia is still in an early stage of development.

**Figure 9: Type of E-commerce Media in 2020 (%)**



Source: Statistics Indonesia.

**Figure 10: Type of Payment Methods of E-Commerce in 2020 (%)**



Source: Statistics Indonesia.

## **D. Conclusions and Recommendations**

### **1. Conclusions**

1. The level of innovation in Indonesia is relatively low, but has a huge market potential. The level of innovation varies by sectors. Most innovations occurred in the sectors of human health and social works, education, and financial and insurance. However, the innovative businesses that are based on the existing economic structure, in order, are financial and insurance, accommodation and food services, information and communication, education, health, human health and social service. The COVID-19 pandemic affected the level of innovation in 2020 which declined (29.7%) from 32% in 2019.
2. The type of innovations in product innovation and process innovation, of which in 2020 is only about 24% of companies innovated internally.

3. The determinants of innovation, beside the economic structure, are the gender balance of the company's executives, the source of domestic investment, the age of the company at the medium level (5–10 years), and the existence of the innovation division in the company.
4. Product innovation has benefited for companies in terms of revenue increase and cost efficiency, and the process innovation has benefited the competitiveness increase. Further, detailed types of process innovation also benefited the revenue and customer service increase.
5. Indonesia's economy has a huge potential in the development of digital technology, but its digital entrepreneurship is relatively low. On the contrary, many unicorns and decacorn start-ups grow in Indonesia.
6. E-commerce in Indonesia is in its early stage. In 2020, as many as 25.25% implemented e-commerce, 80% of which were sellers of their own products, 13% resellers, and the rest brokers of sellers-buyers. Dominantly, the payment methods are cash based. Mostly, the market orientation of e-commerce is domestic, with only 2% are exported.

## **2. Recommendations**

1. The government needs to support the innovation ecosystem by providing synergistic innovation infrastructure and strengthening innovation development institutions.
2. The government needs to support the public innovation for micro and small enterprises to improve product quality, scale-up, and development market networks. It also includes technology certification and innovations for micro and small enterprises as legal protection and to develop business cooperation.
3. The government needs to support the process of adopting digital technology in all economic sectors to take advantage of the large domestic market and benefit from efficiency.
4. Companies need to strengthen business associations in developing innovation collaboration, including partnerships with research institutions.
5. Companies can carry out digital transformation individually or by cluster to optimize market potential, to develop business models, and for cost efficiency. The transformation process can be carried out through collaboration with digital technology companies.

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