PAYMENT SYSTEM DEVELOPMENT IN INDONESIA

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Abstract

The objective of this paper is to provide insight into the payment system transformation in Indonesia. The discussion method uses quantitative descriptive analysis related to the payment system and development, as well as digital payment statistics in Indonesia. To predict the number of digital payment users after 2022, we use quantitative management tools for Windows based on the time series data in the past years. According to the data and analysis, the number of digital payment users in Indonesia continuously experienced a linearly increasing trend each year. Currently, there has been a shift in people's behaviour from using a paper-based instrument previously to using digital payment as a payment method. This shift is in line with the growth of information technology and change in the business model, followed by the new regulations and policies issued by the Indonesia Central Bank.

Keywords: digital payment; system; development; indonesia central bank

INTRODUCTION

A system that encompasses a set of rules, mechanisms, and institutions used to carry out fund transfers to fulfil arising needs from economic activity is called a payment system. The payment system is created in conjunction with the establishment of the concept of money as a medium of exchange or intermediary in goods, services, and financial transactions. The finance system is an infrastructure that supports financial stability, which is set in the process of financial transfers between various parties by decreasing systemic and settlement risks, acting as a firewall to prevent contagion of losses, as well as facilitating effective and efficient liquidity management. A modern market economy depends on an effective and efficient payment system through the banking infrastructure created by the central bank and commercial banks (Siagian et al., 2022). The digital financial product increases the growth of economic and promotes financial stability (Ozturk & Ullah, 2022; Daud et.al., 2022). The media used to transfer the money value between various parties are very diverse, from utilizing a simple payment instrument to a complex system involving several institutions and regulations.

The development of smartphone and ease of accessing the internet makes it easier to carry out digitalization (Ghosh, 2021; Purba et al., 2021). The speed to access financial products and services using mobile phones in higher-income countries is better compared to lower-income countries (Lee et al., 2023). The desire to use digital payment is motivated by the development of the internet, digital culture, ease of use, perceived benefits, view towards digital payment, trust, performance expectation, consumer behavior, social environment, price value, privacy, appropriateness, and technology competence (Alkhowaiter, 2020; Al-Okaily et al., 2020; Daragmeh et al., 2021; Kim et al., 2015; Najib & Fahma, 2020; Patil et al., 2020; Rahman et al., 2022; Sheng & Fauzi, 2023). Although the number of users of digital payments keeps increasing, there are still a few obstacles such

as transparency, security, insider problem, single point of failure, privacy risk (Ahmed et al., 2021; Akanfe et al., 2020). The authority to regulate and maintain the ease of payment system in each country is exercised by each country's central bank as outlined in laws or policies issued by the central bank. The research data above is the research result of several researchers outside of Indonesia. In this research, the writer conducted an analysis and predicted the transformation of the payment system in Indonesia now and in the future, in connection with the internet technology development and shift in the digitalization culture of Indonesian society. The novelty of this research is the topic and forecasting analysis technique that has not been done by other researchers in Indonesia.

In principle, the payment system in Indonesia has three processing stages; the authority to ensure only valid transactions is processed, clearing, or carrying out the transaction process, and final settlement. Payment systems continuously experience change influenced by technology, business model, citizens' behaviour, and government regulation. The payment system can be differentiated into a cash and cashless payment system. Cash payment systems use banknotes and coins as the means of payment. While for a cashless payment system, the instrument used is card payment in the form of a cheque, giro, debit notes or e-money (card-based and server-based). The scope of the cashless payment system can then be categorised into two types of transactions, which are large value transactions and retail transactions.

Based on the payment value, the types of payment in Indonesia can be divided into retail payment systems and high-value payment systems. The retail payment system is used for fund transactions under one hundred million rupiahs, individual transactions (cheque, giro, and transfer), debit or credit card transactions, and bulk transactions (payroll and public service utilities). The infrastructure utilised to process the transaction activity is Bank Indonesia National Clearing System (SKNBI). As for the high-value payment system is usually used for funds transactions above one hundred million rupiahs, important or urgent transactions. For example, interbank transactions, transactions on the financial market or transactions with a ticket size value that is above or equal to IDR 1 billion. The infrastructure that is responsible for this transaction activity is Bank Indonesia Real Time Gross Settlement (BI-RTGS) and Bank Indonesia Scripless Securities Settlement System (BI-SSSS). BI-RTGS is an interbank electronic funds transfer system in the rupiah currency where the settlement is done per transaction on an individual basis. BI-SSSS is a transaction facility with Bank Indonesia, which include its administration and the administration of securities electronically. This facility directly connected to participants, operators, and the Bank Indonesia system – Real Time Gross Settlement (BI-RTGS system)

User behaviour is highly influenced by digitalisation development and penetration into people's life. Furthermore, payment system instruments are becoming increasingly varied with the appearance of chip-based and server-based e-money. The people's consumption patterns start shifting and require all-mobile, fast, and secure payment through different platforms such as the web, mobile, SIM Toolkit (STK), and Unstructured Supplementary Service Data (USSD).

Nowadays, there are people who start to take advantage of virtual currency, which is digital money issued by parties except for monetary authorities and is acquired through mining, rewards or purchasing to conduct various transactions. However, the ownership of virtual currency is highly risky and full of speculation. This is due to the absence of an official administrator, leading to no underlying asset that manages the price and trading value is volatile. Thus, it is vulnerable to a bubble risk, being used for money laundering and financing terrorism, which potentially affects the financial system's stability and is detrimental to society. To mitigate the negative impact of virtual currency, Indonesia Central Bank prohibit all parties from buying, selling, or trading virtual currency as regulated in PBI 18/40/PBI/2016 about the Implementation of Payment Transaction Processing and PBI 19/12/PBI/2017 on the Implementation of Financial Technology.

PBI 18/40/PBI/2016 contains the following rules: compliance with adequate precautionary principles and risk management, consumer protection, national interests, and expansion of access, as well as international standards and practices, licensing, and approvals in the application of payment transaction processing. Transaction processing cover pre-transaction, authorisation, clearing, settlement, and post-transaction activities. Payment transaction processing activities are carried out by Payment System Service Providers (PJSP) and Supporting Providers. The providers for payment system service consist of the principal, switching operator, issuer; acquirers; payment gateway operators, clearing operators, final settlement organiser, fund transfer operator, e-wallet operator, and other payment system services provider stipulated by Bank Indonesia.

While PBI 19/12/PBI/2017 contains the following regulation: the implementation of financial technology must follow the principles of consumer protection as well as risk management and prudence. The application of financial technology is categorised into (a) payment systems, (b) market support, (c) investment management and risk management, (d) loans, financing, and capital provision, and (e) other financial services. The criteria for Financial Technology are as follows: being innovative, benefiting society, widely used, and having an impact on the existing product, services, technology, and financial business model; and following other criteria

set by Bank Indonesia. Financial technology administrator who meets the criteria is required to register with Bank Indonesia. Payment System Service Providers are exempt from registration if they have obtained licenses from Bank Indonesia and/or Financial Technology Operators under the jurisdiction of other authorities. The obligations of registered Financial Technology Operators: apply the consumer protection principle, protect the data and/or consumer information privacy which covers the data and transaction information; apply the principles of risk management and prudence; use rupiah in every transaction conducted within the Indonesian territory following the legislation that regulates the currency; enforce the principle of anti-money laundering and terrorism financing prevention, and meet the requirement of other laws. Financial Technology Operators are not allowed to use virtual currency in payment system activities. The cooperation between Payment System Service Providers and registered Financial Technology Operators requires approval from Bank Indonesia. Payment System Service Providers are prohibited from cooperating with Financial Technology Operators who do not register and/or obtain licensing.

METHOD

This research using quantitative descriptive to analyse the payment system and the digital payment statistics development in Indonesia. To predict the number of digital payment users after year 2022, we use quantitative management for Windows based on the time series regression analysis using the last five years data

RESULTS

Indonesia has the fourth largest population in the world and demographic structures that is dominated by the Y and Z generation. Thus, Indonesia has the most prospective consumer segment to absorb the digitalisation wave. More than 60% of Indonesia's population reached 275 million citizens in 2022 and are in their productive age, between 15 to 64 years old, with 69% (Table 1).

Table 1. Indonesian Population Demographic Data June 2022

Total of Indonesia Citizens	275,361,267	Percentage
Male	138,999,996	50%
Female	136,361,272	50%
Productive age (15-64 years old)	190,827,224	69%
Young age (0-14 years old)	67,155,629	24%
Above 65 years old	17,374,414	6%
Total heads of family	88,929,047	32%

Source: Dukcapil, 2022

Policy orientation and payment system improvement are starting to shift from payment system infrastructure development operated directly by Bank Indonesia to the structuring of payment system industry regulations and institutions, especially retail payment which is inseparable from the impact of the strengthening digitalization trend. Technological advancement affects the payment system in Indonesia from a cash-based to non-cash payment, for example, paper-based payment tool, namely cheque and giro, which is processed using a settlement mechanism. Apart from that, there is also paperless payments instrument such as electronic funds transfer and card-based payment through ATMs, credit card, debit card and prepaid card.

Table 2. Payment System Policy Development in Indonesia

Bank Indonesia Infrastructure Strengthening (SPBI)								Strengthening the regulatory and institutional regime for the SP retail industry					
1909	1953	1990	1998	2000	2001	2004	2005	2009	2012	2015	2016	2017	2022
	Manual Local Clearing												
First Clearing in Indonesia	Bank Indonesia establishment UU No.11/1953	Local Clearing Authorisation System	Jakarta Electronic Clearing System (SEKJ)	BI-RTGS Generation I	SEKJ Full Implementation	BI-SSSS Generation I	SKNBI PBI APMK	Fintech gain Popularity	PBI UE Revision	BI-RTGS/ SSSS/SKNBI Generation II	PBI PTB	GPN Fintech Office Regulatory Sandbox	White paper central bank digital currency

Source: Bank Indonesia, 2022

Bank Indonesia as the administrator of transaction settlement activities through the Bank Indonesia Real Time Gross Settlement (BI-RTGS) system, Bank Indonesia National Clearing (SKNBI) system, and Bank Indonesia Scripless Securities Settlement System (BI-SSSS) have a role to repair and update the existing system mechanisms, to make it always efficient, safe and align with the technological developments and the

ever-evolving needs of society. Bank Indonesia as the payment system provider, starts to operate Payment-versus-Payment (PvP) settlement services on the Bank Indonesia Real Time Gross Settlement (BI-RTGS) system. Settlement service from buying and selling foreign currency transactions, especially the United States Dollar (USD) against the Indonesian Rupiah (IDR) is conducted simultaneously. This action is taken to avoid the risk of settlement failure when the currency exchange takes place. Apart from PvP, strengthening other infrastructure is the unification of BI-SSSS securities settlement function implementation into the implementation of the payment and settlement system functions at Bank Indonesia. The unification is intended to improve the management efficiency of funds settlement and securities activities, as well as the infrastructure and human resources, which in turn increases the quality of Bank Indonesia services toward the related shareholders. SKNBI improvements were made to minimise the credit risk on debit clearing.

The implementation of the no money no game principle on the new debit clearing calculation process requires banks to always maintain adequate initial funding so it can be used to fulfil the payment bill obligations from other banks. The development of the retail payment industry is directed to interoperability creation between systems used to encourage payment system security and efficiency. National standardisation of ATM/debit card instruments and use of chip technology in ATM/debit cards to minimise the possibility of fraud on the ATM/debit card. Interoperability between systems is also created in e-money management.

According to the data in table 3, the flow of money towards the number of e-money instruments from 2012 to 2021 continuously rose, except for the year 2020, when it decreased due to COVID pandemic.

Table 3. Payment System Statistic in Indonesia 2012-2021

COMPONENT	UNIT	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
1						Money in circulation					
Money Supply in a Narrow Meaning (M1)/ Current Price GDP1)	%	80.59	76.24	75.96	77.03	80.49	81.85	80.09	81.04	95.26*	98.13*
Money circulated to Current Price GDP	%	5.10	5.24	5.00	5.09	4.94	5.11	5.05	5.01	5.82*	5.66*
Money circulated to household consumtion current price	%	9.22	9.40	8.94	9.04	8.72	9.11	9.06	8.85	10.10*	10.39*
Currency circulating in the society to Third Party – Rupiah	%	13.12	13.21	12.21	12.81	12.42	12.92	12.96	12.68	13.21	12.76
2						Payment instruments using card & electronic money					
Dana Float towards number of electronic money instrument	IDR/Unit	-	9,537	13,833	21,501	19,185	26,957	24,120	21,015	18,260	19,314
Real Time Gross Settlement (RTGS)											
Transaction Volume	Thousand Transaction	17,498	17,634	17,742	11,044	7,657	10,229	11,087	11,273	9,632	10,128
Transaction Value	Billions of Rupiah	99,397, 110	90,960, 519	110,797, 424	112,971, 195	111,827, 354	118,531, 921	121,641, 844	127,596, 111	156,997, 379	195,586, 296
National Bank Indonesia Clearing system (SKNBI)											
Clearing Nominal Distribution2)											
Credit Debit	%	29.13	34.86	42.03	52.25	65.34	70.09	76.34	80.87	86.51	89.58
1. Cheque	%	9.43	8.72	7.79	6.50	4.89	4.45	4.04	3.38	2.56	2.00
2. Giro	%	61.41	56.40	50.16	41.24	29.77	26.00	19.61	15.74	10.92	8.41
3. Others	%	0.03	0.02	0.02	0.02	0.01	0.03	0.01	0.01	0.00	0.00
Capital Market											
Contract total and transaction received by CCP	Millions of Transactions	451,042	547,578	457,740	463,760	557,450	709,831	698,272	1,073,048	801,871	1,546,373*
Contract and transaction value received by CCP	Billions of Rupiah	387,957	718,738	649,324	590,015	683,938	695,155	787,424	838,903	792,545	1,120, 666*
Value of Securities Administered in CSD	Billions of Rupiah	2,741, 987	2,594, ,087	3,157, 342	2,967, 417	3,488, 028	4,331, 139	4,103, 485	4,337, 316	4,317, 000	5,524, 684*

Source: Bank Indonesia, 2022

DISCUSSION

Payment system development in Indonesia is highly influenced by the cheaper and easier access to digital infrastructure and strong digital literacy tendencies of Indonesian citizens in adopting the digitalization flows in Indonesia. The ease of access is reflected in the smartphone price that became more affordable and the widespread availability of high-speed internet. In 2022, the internet reached 210 million or 77% of Indonesia's total population. Moreover, figure 1 shows that according to the Indonesian Internet Service User Association (APJII) 4, internet penetration in Indonesia annually increases, especially when COVID-19 occurs.
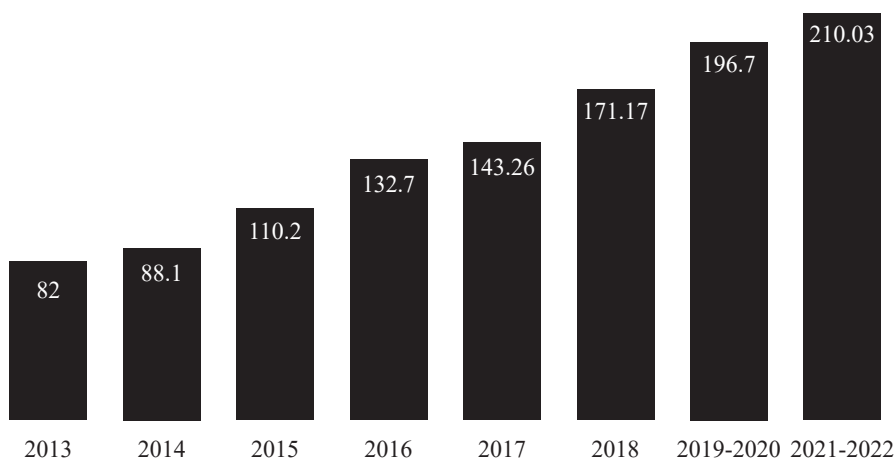
Figure 1. Internet penetration in Indonesia 2013-2022 (in millions user) (APJII, 2022)

The internet penetration rate in Indonesia based on age is dominated by people around 13-18 years old with 99.16%, followed by 19-34 years old with 98,64%, and age range of 35-54 years old with 87.3%, as shown in figure 2. Furthermore, based on the income level, people with income above 5 million to 15 million rupiahs per month spent most of their time on the internet with a penetration rate of 96.83%.
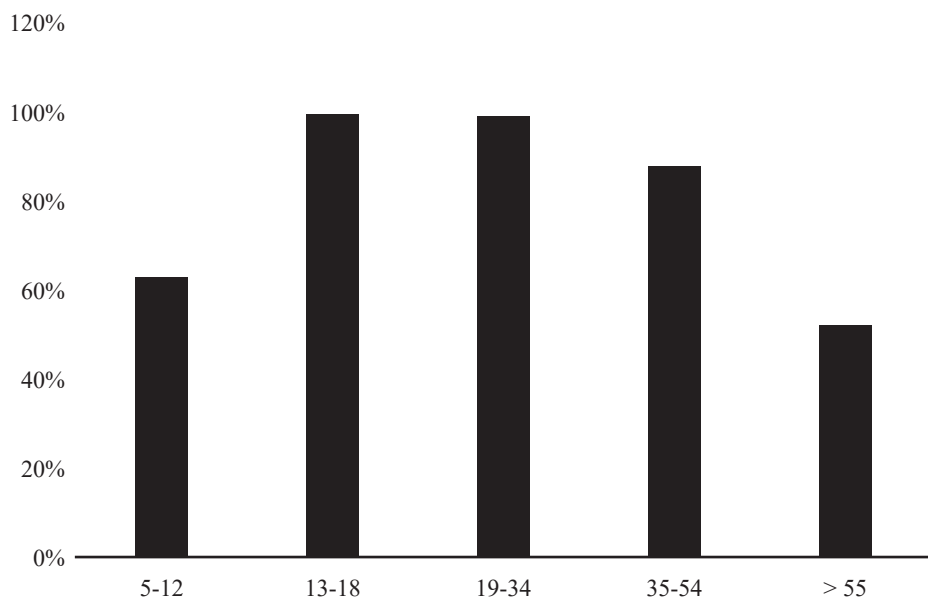

Figure 2. Internet User Percentage Based on Age (APJII, 2022)

The total of social media users in Indonesia, where the majority of users are Z and Y generations continues to rise. In 2022, the social media that is widely accessed is Facebook, Instagram, YouTube, and Tiktok. The rising number of social media users is influenced by the ease of use and cheaper internet access in Indonesia. Figure 3 further illustrates the internet user percentage.
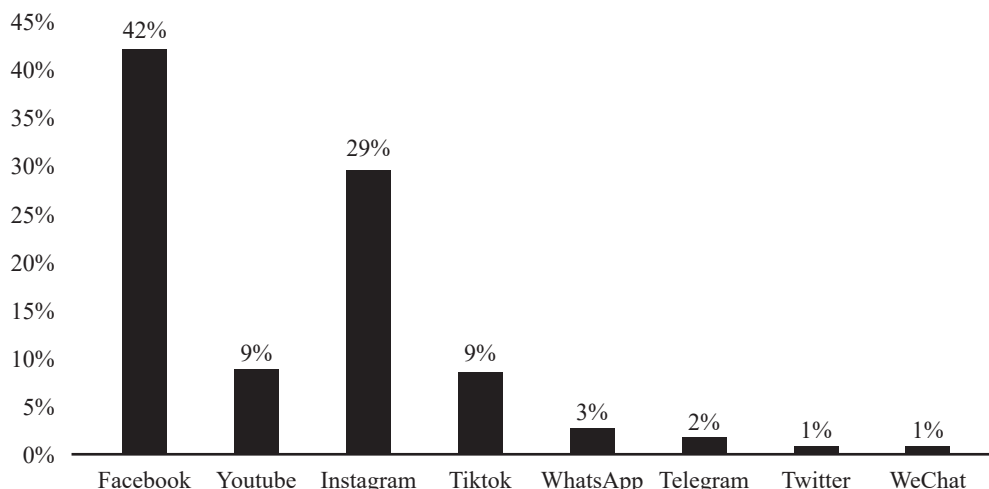
Figure 3. Social media users in Indonesia 2022 (Statista, 2022)

In an era where technology develops rapidly, the use of digital payment as an alternative option to cash has become more widespread. In Indonesia, people who use digital wallets are rising continuously. From 2010 until 2017, the number of transactions that use e-money increased by an average of 72% per year (Ghosh, 2021). Digital finance is part of financial innovation and commonly utilized in the grocery, F&B, retail, and transportation sectors (Lee et al., 2023; Putri et al., 2020). There are various E-wallet platforms in Indonesia that people can choose from. The widely used digital wallets are GoPay, OVO, Shopee Pay and Dana (Daud et al., 2022; Ozili, 2018). Among those digital wallets, several researchers claimed that OVO is the most popular e-wallet with a payment device available in 303 cities in Indonesia, followed by Shopee Pay in the second place (Budiarani et al., 2021; Widayat et al., 2020). Additionally, the number of e-commerce customers in Indonesia is dominated by Tokopedia, Shopee, Lazada, Bukalapak and Blibli. Figure 4 shows the total of monthly customers visiting the e-commerce platform.
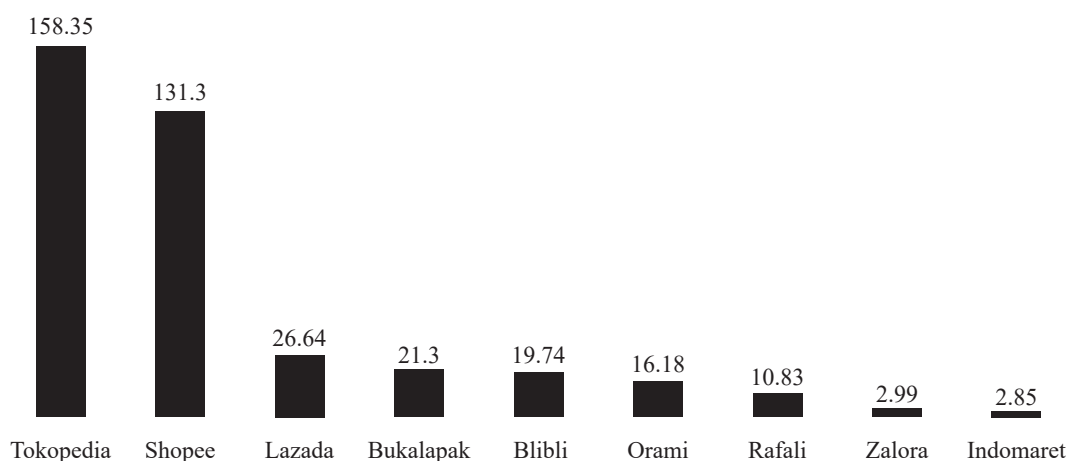
Figure 4. E-commerce monthly traffic in Indonesia 2022 (in million web visits) (Statista, 2022)

The COVID-19 pandemic further encourages people to adopt digital payment methods. The lockdown enforcement and some merchants' decision not to accept cash to prevent the transmission of the virus have led to rapid growth in digital payment users (Sarkar, 2019). As can be seen from figure 1, the total user of digital payments in Indonesia reached 158.67 million in 2021. Bank Indonesia also claimed that within three months, from March to May 2022, the total of e-commerce transactions was approximately 59.06 billion Rupiah. Some digital wallet is interlinked with an e-commerce platform, for example, ShopeePay, which is a digital payment method introduced by Shopee. Therefore, most digital wallets in Indonesia recorded a higher number of active and new users since the pandemic (Budiarani et al., 2021). Figure 5 forecasts that by 2025 the number of users is expected to reach 221.07 million users. This indicates that the upward trend of digital payment usage in Indonesia likely to continue in the future.
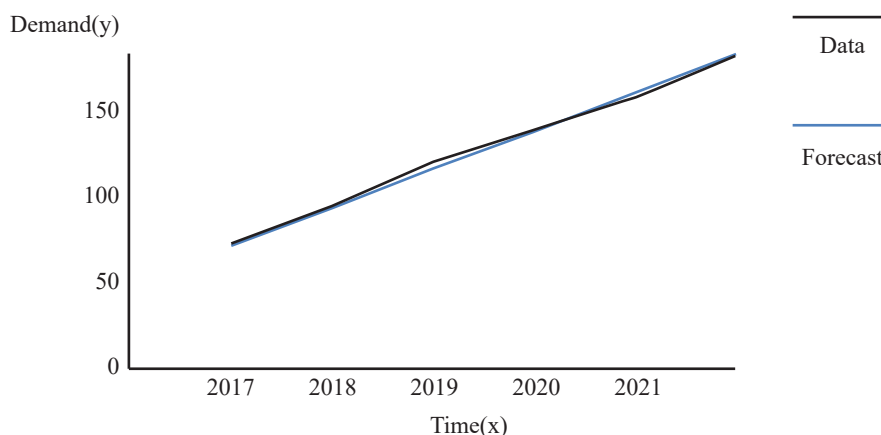
Figure 5. Trend of digital payment users in Indonesia from 2017 to 2022 (in millions – data processed)

According to the analysis trend using the Quantitative Method (QM) for Windows with a mean absolute deviation level of 1.23, it was found that each year the number of digital payment users in Indonesia is likely to increase linearly following the equation trend $(Y) = 49.263 + 22.185$ time (x). The analysis result using QM for Windows is based on the linear equation above, which then use to forecast the user from 2022 to 2025, as seen in Figure 6.
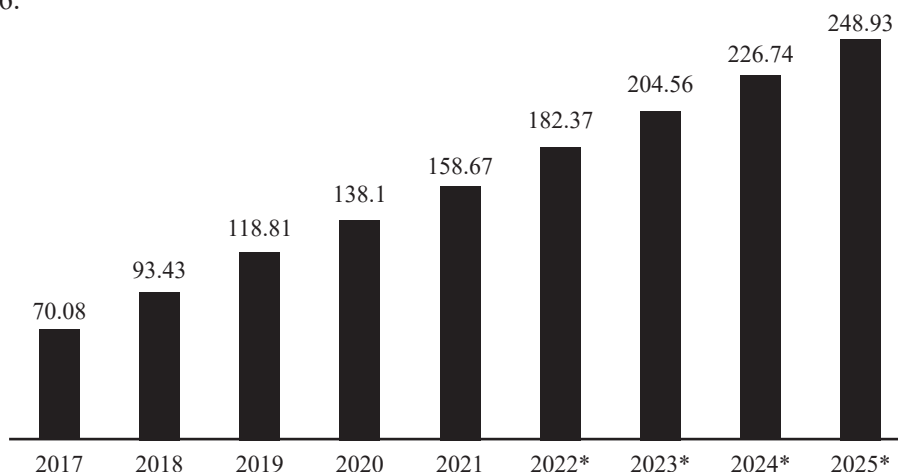

Figure 6. Digital payment users in Indonesia from 2017 to 2021 actual (Statista) and 2022 to 2025 prediction (in millions – data processed)

Up to now, several studies have indicated that the majority of digital payment users are Gen Z. They are the ones who have more knowledge of information technology, own an electronic device, and are quick to adapt to any technological changes (Ozili, 2018). In terms of gender, a survey indicates that most of the digital payment users are female, which is associated with online shopping tendencies for females (Ghosh, 2021). On the contrary, the Statista report shows that the share of male users was slightly higher than that of female users in 2021, with 52.87% male users (Siagian et al., 2022). Furthermore, the frequency of e-wallet usage varies depending on the user's need. Some people use digital wallets weekly with a frequency of 1-2 times to 6-10 times a week (Budiarani et al., 2021; Ozili, 2018).

There are several reasons why people choose e-wallets as their payment method. One of them is the ease of use. People are more likely to adopt a technology when they did not have to put a lot of effort to use it (Khatimah et al., 2019). A digital wallet is easy to carry around as the user can store it on their smartphone and access it anywhere, leading to a faster financial transaction (Prasasti et al., 2021). Furthermore, some e-wallets such as Gopay and ShopeePay, are interlinked with the e-commerce platform, making the transaction more efficient for the user (Statista, 2022). When users find digital payment beneficial and convenient to use, they are more likely to stay loyal to their e-wallet (Ozili, 2018; Sarkar, 2019).

Discounts are also crucial to attract new users and keep the existing user stay loyal. Many e-wallets in Indonesia tried to strengthen the consumers' loyalty and trust through promotional programs offered by using their platform. Without the discount or cashback, some people are unlikely to continue using the e-wallet (Purba et al., 2021). Therefore, it can be assumed that the user's intention to use digital payment methods is partly driven by financial incentives.

Apart from ease of use and discount, security is a major factor influencing the adoption of digital payment. The feelings of security and lower uncertainty build user trust, which positively affects user behaviour and confidence in the e-wallet (Kim et al., 2015; Prasasti et al., 2021). However, there were numerous data protection issues and scams in Indonesia that damaged users' trust towards digital payment (Sarkar, 2019). The concern of security potentially prevents people from using digital payment. As a result, several researchers believe that the government or regulators need to strengthen the regulation of digital payment and enhance public understanding of financial technology services to persuade more users (Prasasti et al., 2021; Purba et al., 2021).\

The Indonesia Central Bank has launched five Indonesian Payment System visions and a blueprint for Indonesia Payment System in 2025. The visions and blueprint aim to provide clear direction to gain digitalisation benefits while ensuring the application of Bank Indonesia's mandate in money circulation and monetary and financial system stability.

Five Vision SPI 2025: First, support the national economic integration – of digital finance in such a way that it guarantees the central bank function in the operation of money circulation, monetary policy, and financial system stability, as well as upholding financial inclusion. Second, support banking digitalisation as the main institution in the digital economy-finance through open banking, utilising digital technology and data in the financial business. Third, ensure the interlink between fintech and banking to avoid shadow banking risk using digital technology arrangements such as Application Programming Interface-API, business collaborations, or company ownership. Fourth, ensure a balance between innovation and consumer protection, stability and integrity, and healthy business competition through the implementation of Know Your Customer (KYC) and Anti-Money Laundering/Combating the Financing of Terrorism (AML/CFT), disclosure obligations for public data/information/business, and application of reg-tech and sup-tech in reporting, regulatory, and supervisory obligations. Fifth, ensure national interest in the digital economy-finance between countries with the obligation to process all domestic transactions within the country and cooperation between foreign and domestic operators by taking into account the reciprocity principle.

The five SPI 2025 vision is then realised into five initiatives through a collaboration programme or programme that is carried out solely by Bank Indonesia. The first initiative is open banking and interlink bank-fintech implemented through the standardisation of open APIs that enable the safe disclosure of bank and fintech financial information to third parties. Next initiative is retail payment development that heads to 24/7 real-time operations with higher levels of security and efficiency. This is done through fast payments, optimising the National Payment Gateway (GPN) and developing a unified payment interface. The third initiative is the development of a wholesale payment and financial market infrastructure. This scope includes several developments, one of which is the development of Real-Time Gross Settlement (RTGS). The fourth initiative talks about developing national data that is collaborative and integrated to optimise utilisation. The fifth initiative is to perform the arrangement, supervision, licensing, and reporting for the digital financial economy acceleration

CONCLUSION

The payment system in Indonesia has undergone a change from using paper-based instruments such as cheques and giro previously to digital payment utilizing a credit card, debit card, or electronic money, both chip-based and server-based as means of payment. The increase in digital payment users is quite significant. Until the end of 2021, there have been one hundred and fifty-nine million users, and this keeps rising each year. The development of information technology, growth in internet and social media users, and change in the business model significantly affect the increase of digital payment users in Indonesia. The writer suggests that it is crucial for the government to realize the need for stronger regulation to boost user trust in the digital era. Indonesia Central Bank enforces a set of rules that clearly outlined the function of the Indonesia Central Bank in managing the financial system stability, monetary policy, and minimizing potential cybercrime. The data used in this research is until the end of 2022, while the information technology and shift in digital culture develop rapidly among Indonesian citizens. Thus, several years ahead, other researchers can conduct research related to the trend of digital technology utilization in Indonesia using updated data and expand the analysis on other variables that affect the payment system development in Indonesia.

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