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Bolstering financial inclusion in Indonesia

How QR Codes can drive digital payments and enable financial inclusion

Contents

Making financial services available and affordable to the public can lead to increased economic activity and growth. Research has shown that platforms easily accessible to everyone, regardless of their income, and tightly integrated into the financial fabric of the society, pave the way for inclusive and accelerated growth.

Foreword

It is inevitable that a day will come in the not-so-distant future where we will live in a cashless society. We are already living in an age of a rapid evolution towards cheaper, faster, friendlier and safer payment methods that will drive wider financial inclusion and acceptance. We have become accustomed to cash over hundreds of years and more recently to physical tokens representing cash including cheques and plastic cards with magnetic, chip and even wireless functionalities. Ultimately, all these payment methods have leveraged physical tokens to represent cash or electronic value. This has typically come at a cost for customers who have to collect the token and banks, who have to manage token issuing and usage.

Now, we are witnessing the introduction of novel, dematerialised payment solutions powered by digital technologies. One of these novel solutions swiftly expanding throughout the Indonesian market is the Quick Response Code Payment (QR Payment). This form of payment provides convenience and benefits that far supersede those of other commonly available payment methods. Most importantly, QR Codes can be read by smartphone devices, which most economically active Indonesians now own.

An increase in QR Payments across wider geographical and sociocultural areas of Indonesia will accelerate the velocity of money circulating in the country. In turn, this will help drive Indonesia's GDP and further enable the digital economy to flourish.

However, Indonesian QR Payments are still in its infancy. To help shape the trajectory towards faster maturity and adoption, Deloitte has brought together thoughts and perspectives from major QR Payment providers in Indonesia as well as secondary research on some of the main QR Code use-cases around the world. We hope these insights prove valuable in setting QR Payment expectations, inevitably charting the way forward towards its implementation and adoption in Indonesia.

I would like to take this opportunity to thank Niki Santo Luhur, Kuseryansyah and Ajisatria Suleiman from FinTech Indonesia as well as Mohit Mehrotra, Erik Koenen, Ben Davis and many more from Deloitte who supported the development of this report. I would also like to extend our gratitude to Anang Fauzie from Bank Negara Indonesia, Ari Awan from Dimo Pay Indonesia, Budi Gandasoebrata from GO-JEK and Setiawan Adhiputro from OVO for sharing their unique QR Code use-cases and perspectives.

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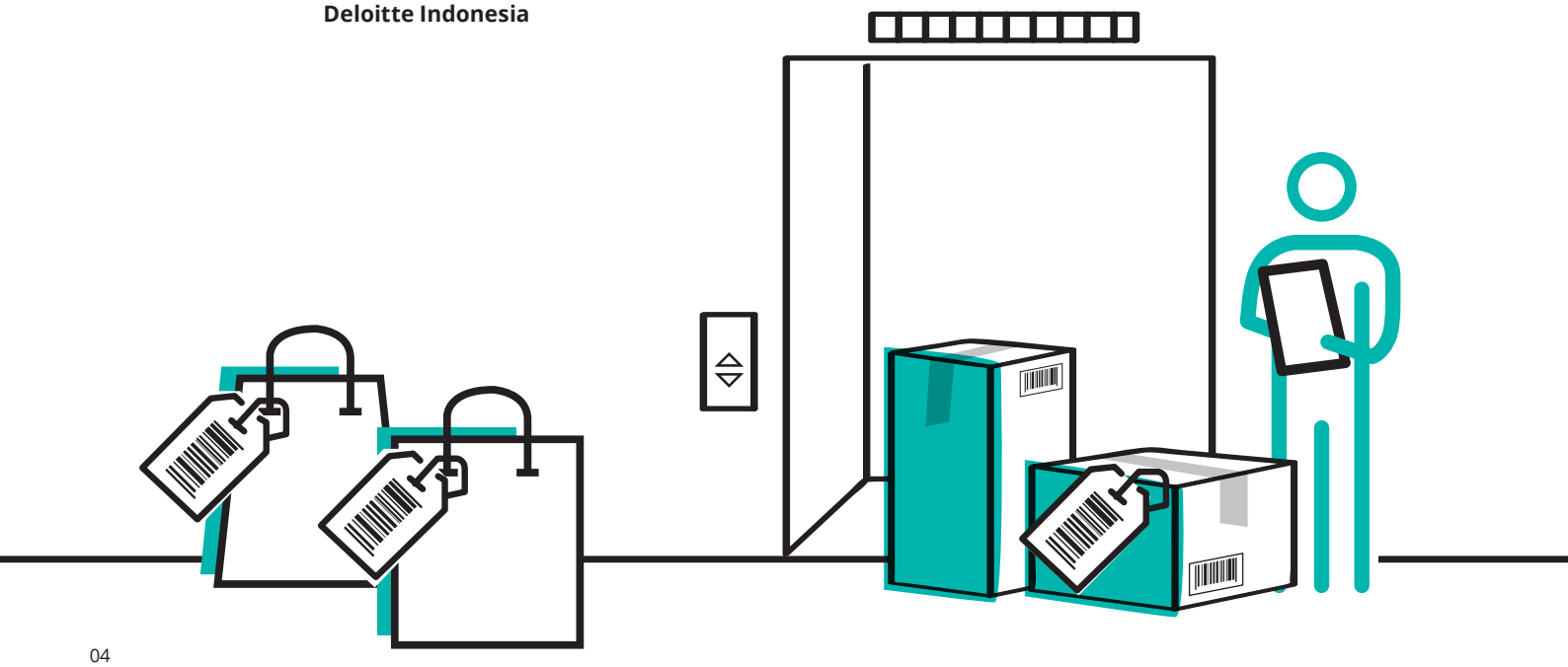


An introduction to our study

The study examines different adoptions of QR Code in the context of cashless payments and financial inclusion in Indonesia.

Background

Advances in technology continue to unlock new business opportunities that allow innovative and nimble market entrants to compete with established market leaders. In turn, this competition drives incumbent companies to adopt emerging technologies, and new ways of working in order to maintain their relevance in the digital age.

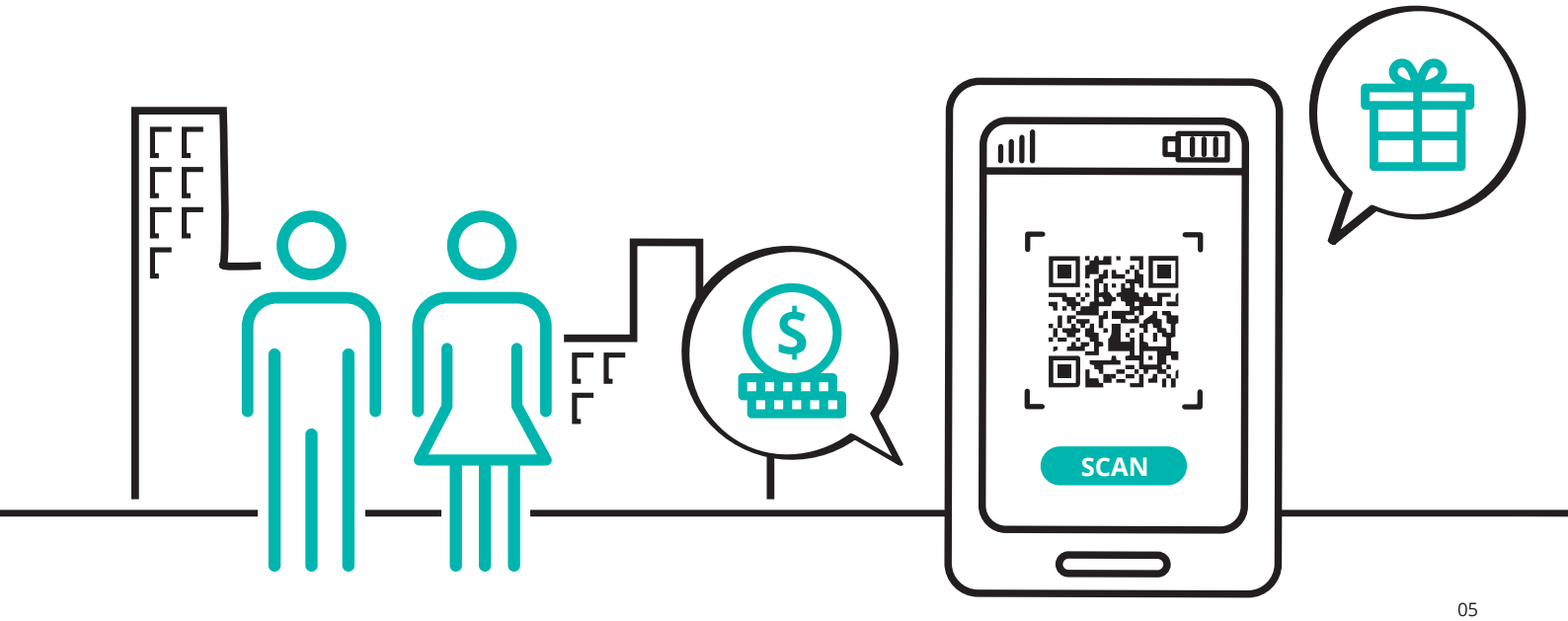
In the middle of this dynamic and competitive market force sits the consumer, spoiled for choice with a plethora of ever-increasing number of digital services. The level of competition for a consumer's attention drives market innovation at levels unseen before. Both new entrants and incumbents race to offer greater value-add through newer, more innovative, and cheaper services, with improved convenience and user experience.

The key enabler of all this is the smartphone. The smartphone is fundamental to the digital innovation wave disrupting industries across the world. The rate of smartphone penetration has already exceeded any other consumer electronic device that preceded it. Meanwhile, a smartphone's affordability and computing power are improving with every new release, making the smartphone more available and more useful to more people around the world. Amongst functionalities brought forth to mainstream usage through the popularity of the smartphone, and the premise of this paper, is the use of QR Code to process electronic payments. QR Payments allow smartphone users to perform financial transactions with convenience, while maintaining the transaction's integrity and security at an affordable cost. The QR Code is now widely regarded as a foundation for the future of cashless payments in the digital age.

Objective

In this paper, we explore the methodologies and models for mobile payment transaction enabled through QR Code with the objective of promoting financial inclusion and a cashless society in Indonesia. We also look into QR Payment applications and regulations across different markets. The study is part of a larger research which aims to understand the underlying technology, regulations, and risks which are involved in the use of QR Codes. The paper also covers payment methods and use of payments in Indonesia.

Finally, the paper introduces three different scenarios that explore possible insights on the governance of innovation and adoption of technology to serve the goals of achieving financial inclusion and developing a cashless society in Indonesia.



The QR Code demystified

History

The story of the QR Code (Figure 1) began in the 1970s, with the introduction of the one-dimensional (1D) barcode (Figure 2a). The traditional 1D barcode found its early popularity within automotive and retail supply-chain. In comparison to manual tasks, scanning barcodes increased data-entry speeds, and simultaneously reduced data-entry errors. While the use of barcodes became increasingly popular, bottlenecks quickly emerged as well. Specifically, the amount of data that could be encoded with the 1D barcode was severely limited and there was an increasing demand to encode more than twenty alphanumeric characters the 1D barcode was limited to.

Figure 2a: 1D barcode developed in the 1970s

Denso Wave Incorporated, a division of Denso Corporation owned by Toyota, which was developing 1D barcodes at the time, proposed the two-dimensional (2D) barcode in 1994 (Figure 2b). This gave way to what is now known as the QR Code.

Figure 2b: 2D QR Code created in 1994

The QR Code is superior to its 1D predecessor in two key ways:

1. It can store up to 4,300 alphanumeric characters.
2. It can be read at a greater speed and scanned from any orientation.

While QR Code adoption is accelerating, there are consistent efforts to further innovate and create new and enhanced types of QR Codes to meet the increasingly complex user needs and requirements. Examples include the micro QR Code which was created for smaller print areas; iQR Code which has a smaller footprint with large coding capacity; FrameQR which allows photos to be encoded; and variations that support enhanced security and privacy features.[1] As QR Code technology advances, consumers' needs and wants also change with it. The proliferation of different QR Code technologies and its widespread global use have raised the importance of the need to standardise data encoding within a QR Code.

Standardisation

The QR Code received approval as a standard within different fields from 1997 onwards: as an Automatic Identification Manufacturers International standard in October 1997, as an ISO/IEC 18004 in June 2000, and finally by GS1, an international standardisation organisation, as a standard for mobile phones in December 2011.[2]

Denso Wave standardised the QR Code since its first inception ensuring that no matter who creates a QR Code or builds a QR Code reader, it would all be interoperable. Standardisation also encouraged the uptake of its use and user confidence in the technology. While Denso Wave has patents that protect the technology, the company has reassured that it would never enforce them unless the QR Code did not conform to the international standards.

Figure 1: A timeline outlining the evolution of the barcode and QR Code

1970-1974
IBM developed UPC symbols for automatic input to the computer and the use of barcodes in the retail space takes off.

1994
The QR Code is born as Denso Wave developers released a code that could handle up to 7,000 alphanumerical characters.

1997
The QR Code was approved as an AIM standard and used in the automatic identification industry.

2000
The QR Code was approved by the ISO as one of its international standards.

2004
Creation of a micro QR Code which was created for smaller codes to be printed in reduced amounts of space. This was made into a JIS standard.

2008
iQR Code was developed with a small footprint and large coding capacity, allowing the use of rectangular code modules.

2014
"FrameQR" was developed, which enhances the design of the code by combining illustrations and photos.

2015 - present
QR Codes take the mobile payments space by storm with the rise of WeChat and Alipay.

Payment methodologies and models

Let's take a look at the main payment methodologies and models prevalent today

Humans have been paying for products and services ever since we settled down into societies and began trading. Bartering, the first form of trading, consisted of exchanging of goods of like and equal value. For example, a person exchanged a piece of meat he hunted for some fruits his neighbour gathered. Although societies were able to survive on the bartering system for a period of time, as transactions increased, difficulties arose. The lack of a common measure of value of an item and the indivisibility of goods are some examples. If a person had more meat than usual and his neighbour did not have enough fruit of equal value to the meat, the trade could not take place.

The invention of money used as a form of payment for trading took humanity to the next level of social evolution: from coins to paper notes, cash played a key role in trading at all levels within and across societies. This dominance of cash was to take us all the way through to modern times. However, the dominance of cash has shifted at the turn of the century where alternative payment methods have become possible due to technological advances. Cashless payments that utilise technology to enable trade convenience for consumers and merchants have emerged; thus challenging cash as the reigning mode of payment.

In this section, we look at both cash and cashless payments to understand their inner workings and benefits they provide.

Cash

Before the wave of digitisation, cash dominated as the main method of payment. Although the market share for cash has steadily eroded over the years as modern cashless payment technologies have taken off, cash still maintains some advantages over the more contemporary payment methods.

One of the most obvious advantages is that cash transactions provide instantaneous and tangible feedback. A cash transaction starts and ends in a physical point in time and it does not require data exchange such as personal or bank information.[3] There is no dependency on third parties in the process which helps mitigate issues related to security breaches faced by digital modes. The merchant benefits from this form of payment too. There are no associated transaction fees and the merchant receives a greater return on goods and services rendered.[4]

The cash cycle (Figure 3) is a complicated and highly interactive process, where players with diverse incentives are forced into cooperation while being closely monitored by a regulator.[5] Some of the disadvantages associated with cash are related to handling costs, fraud, and money laundering. Handling cash is seen as an inconvenience for many, and carries concerns around robbery and physical security. At the same time, processing cash typically incurs high costs. Prior to cash reaching the hands of consumers, it passes through various parties. The process begins with a central bank manufacturing the cash. Next, the cash is distributed to operation centres, bank branches and automated teller machines (ATMs), before it ultimately reaches consumers. Every step throughout the process incurs cash handling costs. Moreover, there are governance and administration measures such as managing cash deposit and withdrawal systems, counterfeit detection, forecasting accuracy, security, and labour cost allocations for each step (Figure 3).

Figure 3: The cash cycle and pain points in the supply chain

Central Bank	Cash Operations	Branch	Consumer
• Manufacturing • Quality Control • Circulation Control • Counterfeit Control	• ATM Management • Branch Management • Cash Management & Logistics	• Teller Services/ ATM • Deposit Collection • Cash Handling • Foreign Exchange	• Cash Handling
• Risk adverse to adopting new technology and automation • Risk adverse to updated regulatory requirement changes • Market monitoring and governance costs • Security concerns	• Oversight, labour costs • Duplication of manual efforts • Cash management systems • Cash forecasting errors • Cash transportation costs to branch/ ATM • Security concerns	• Conservative towards new technologies and changes • High reliance on manual labour • Inefficient processes with duplication across product lines • Security concerns	• Customer habits drive high-cost-to serve per individual: – Branch servicing interactions – High transaction volumes with low value – Low financial literacy – Security concerns

(Source: Asian Banker Research)

Cashless payments

The digital era brought significant technological advances to the payments industry, namely cashless payments. Cashless payments helped overcome many of the limitations associated with cash. To understand how cashless payments work, we can look at the Four Party Payment Model, the most common framework underpinning cashless payments.

Four Party Payment Model

The Four Party Model is a payment business model originally created to process card transactions. Today, it underpins most electronic payments. The four parties comprising the model are:

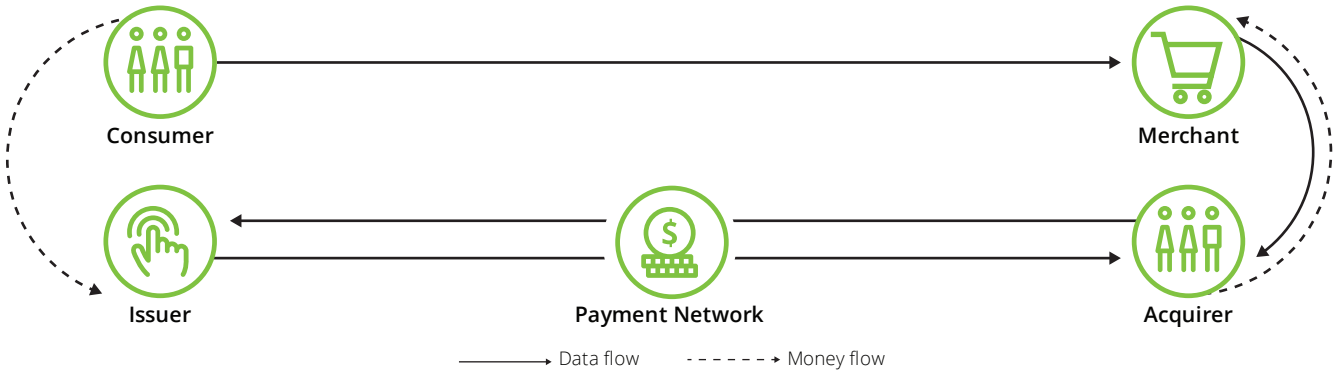
1. Consumer purchases the goods
2. Merchant sells the goods
3. Issuer provides the payment on behalf of the consumer
4. Acquirer processes the payment on behalf of the merchant

During a transaction, the information flows between the parties via a payment network. Visa, MasterCard and UnionPay are examples of payment networks that employ the Four Party Model.

Although the Four Party Model is historically closely linked with card payments, most emerging payment methods today adopt the same approach. Some of these newer joiners are mobile network operators, technology manufactures and vendors, such as Vodafone, XL-Axiata, Apple, Samsung, Google and Wirecard.[6]

The Four Party Payment Model relationships defined by data and money flows between the entities are summarised in Figure 4.

Figure 4: Relationships between the entities in the Four Party Payment Model

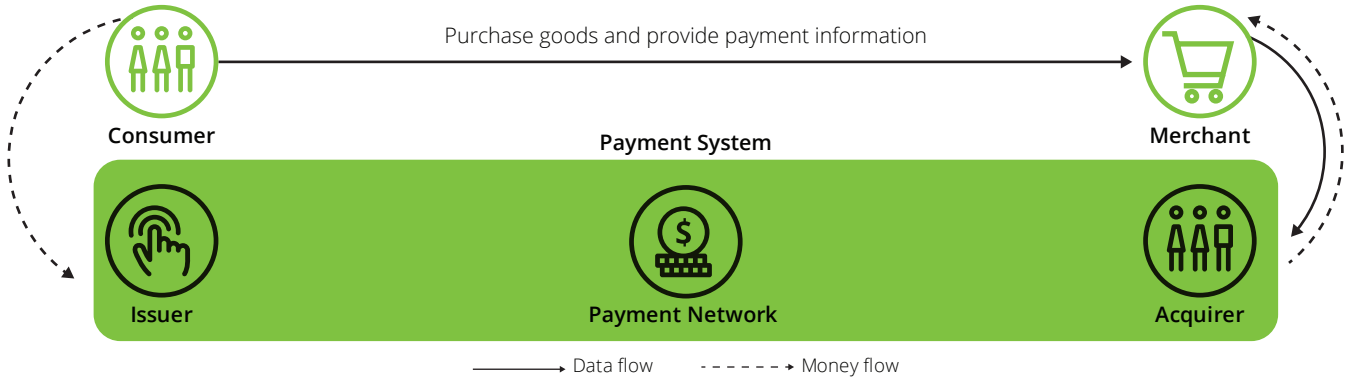


Closed-loop vs. Open-loop Payment Systems

Payment methods are often categorised as closed-loop or open-loop systems.

In a closed-loop system (Figure 5), the Payment System platform is managed by a single company that has direct relationships with consumers and merchants. It allows consumers to add credit into an exclusive spending account that can be spent only at specific merchants. Some examples of retailer and card networks using the closed-loop systems are American Express (Amex), Diners Club, and private labels such as Starbucks and Walmart. Amex and Diners Club-issued cards can only be accepted by merchants affiliated with its platform and charges both consumers and retailers directly. The system used by Starbucks and Walmart is similar, except that the acceptance network is limited to their respective stores only.

Figure 5: A closed-loop payment system

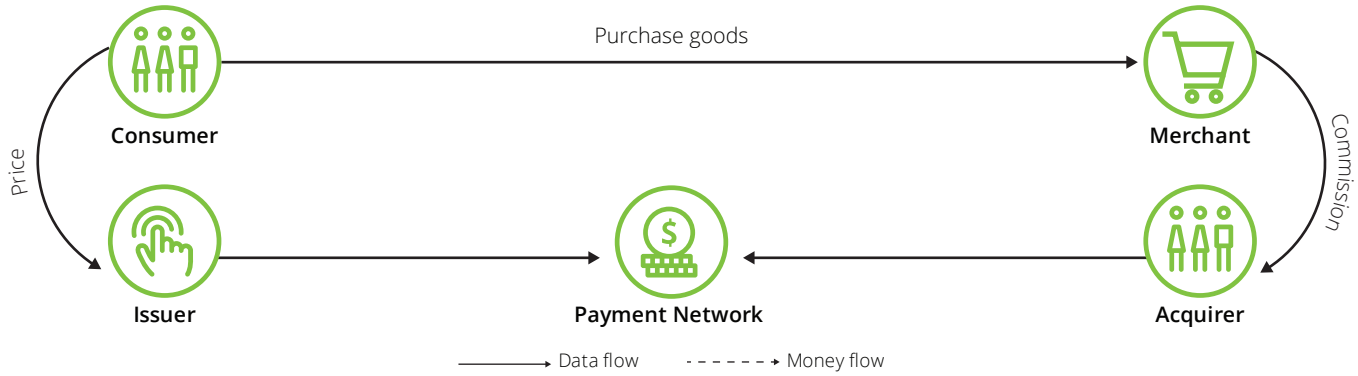


The processing of a closed-loop system is slightly simpler than an open-loop one as it eliminates the need for a processing network. Since the merchant's bank communicates directly with merchants as well as merchants' customers, this lowers the processing costs for merchants. Another advantage in the closed loop system is that the Payment System operator has full visibility and control of the transaction data. This allows the operator the improved ability for in-depth customer data analysis, opening opportunities to optimise the ecosystem operations and monetise customer data.

Open-loop payment systems (Figure 6) are more complex as the members act as intermediaries between the platform and its end-users, consumers and merchants. Two levels of pricing must be taken into account: the pricing of the services provided by the platform to banks; and the pricing of services provided by banks to end-users.

The fees charged to end-users depend on the degree of competition between banks. Visa and MasterCard payment card systems are examples of open-loop systems. Banks pay fees to become members, but remain free to choose their pricing policy with regard to consumers and merchants. Apart from traditional players like Visa and MasterCard, new entrants in the mobile payments domain include Apple Pay and Android Pay.

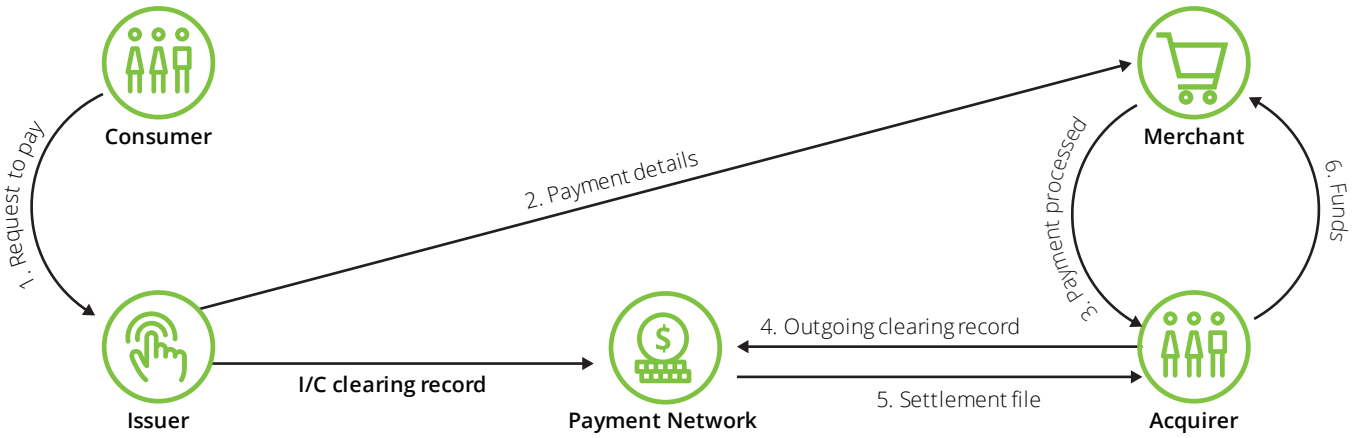
Figure 6: An open-loop payment system



Pull vs. Push Payments

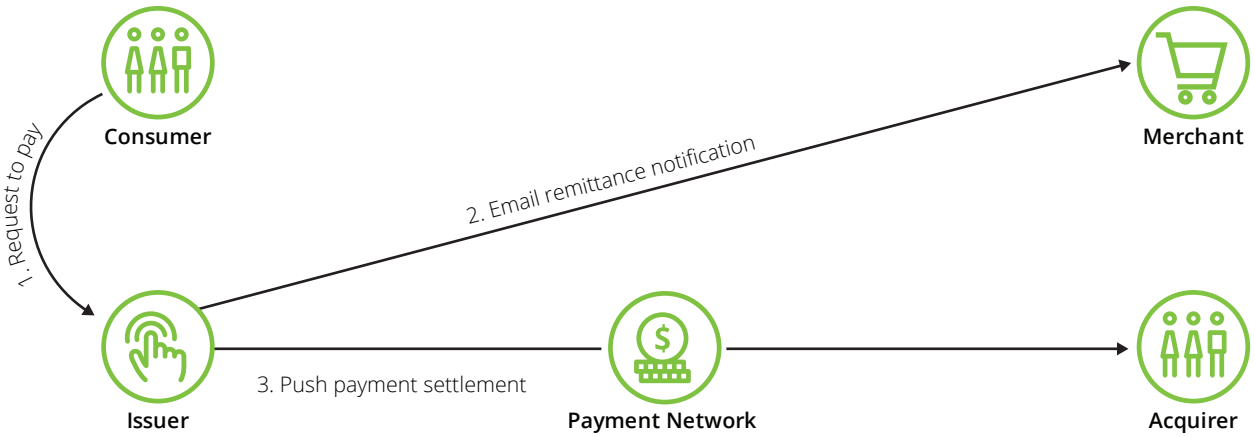
Pull payments (also known as supplier-initiated payments) are the more conventional type of payments (Figure 7). In this scenario, the consumer receives and approves an invoice, and then pays the supplier for goods and services received. The supplier (or their bank) then processes the payment transaction, after which both the buyer and the supplier will reconcile when the payment clears. Traditional credit cards, wire transfers and checks are examples of pull payments.

Figure 7: Pull Payments



With push payments, the consumer receives and approves the invoice and submits the payment just as with a pull payment. However, the difference with a push payment is that the transaction processes automatically and the funds are pushed directly into the merchant's account. ACH (Automated Clearing House), wire payments and direct deposit are examples of push payments.[7]

Figure 8: Push Payments



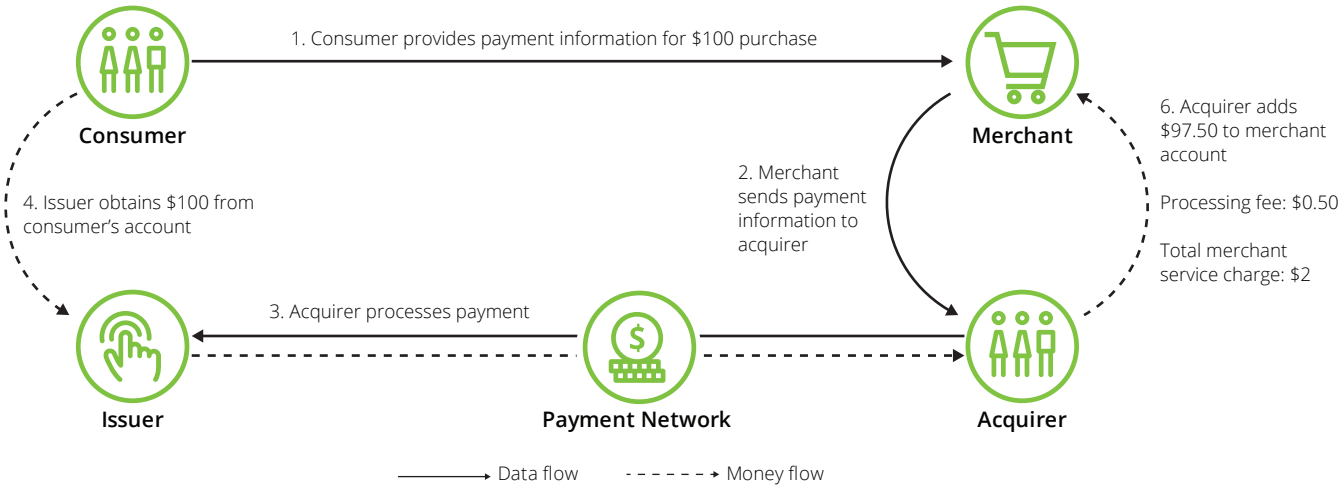
Having introduced fundamental types of payment systems, next we explore popular cashless payments.

Card Payments

The concept of card payments was first introduced in 1950 by the Diners' Club, Inc. Since then, there has been a proliferation of different card types, chief among these being credit cards, debit cards, charge cards, ATM cards and fleet cards. By providing improved payment convenience and experience for both consumers and merchants, the use of cards as a form of payment has significantly reduced the reliance on cash payments.

Card payments rely on one or multiple banks acting as issuers and acquirers with a card company working as the payment network. The relationship between the different parties in a card payment system is illustrated in Figure 9.

Figure 9: Card payments



1. The consumer purchases goods and/or services from a merchant and selects a card to pay with.
2. The merchant sends the consumer's card information to the acquiring bank.
3. The acquiring bank sends the card information to the issuing bank through a card payment network.
4. The issuing bank validates the transaction, and if approved, debits the purchase amount from the consumer's account.
5. After the issuing bank approves the transaction and before it forwards the payment amount to the acquirer, it deducts the processing and interchange fees from the total sale price; the fees depend on a card, banks and markets involved.
6. In the final step, after the acquiring bank receives the payment amount from the issuing bank, it deducts its own service charge for transaction handling and deposits the outstanding payment balance to the merchant's account. As such, only the outstanding amount of the actual retail price (97-99%, typically) is transferred to the merchant. Over time, the consumer's account is debited with the retail price of the goods and/or services rendered.[8]

Over the years, the card payment ecosystem has evolved to leverage digital channels, giving consumers the ability to purchase goods and services over the phone and online.[9] Additionally, utilising a credit card allows consumers to build a credit history with a given bank, thereby allowing the bank to assess a consumer's credit worthiness for other financial services such as a car or home loan.[10]

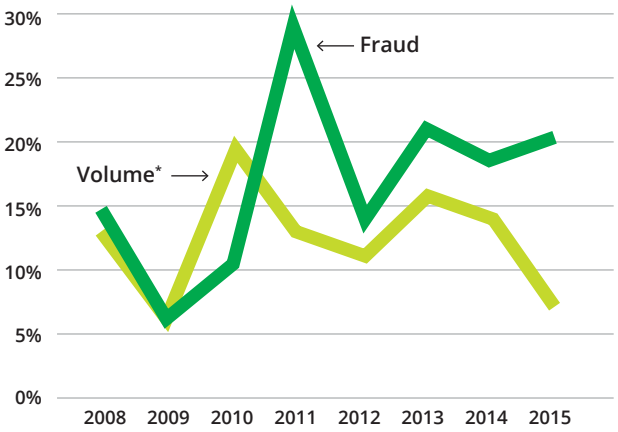
The overall improvements in payment convenience and availability have led consumers, in some cases, to overspend. In the end, consumers may end up paying more for a purchase using a card than in cash, incurring additional interest rates and cardholding fees.[11]

The use of cards is generally preferred over cash as it provides added security features to prevent fraud. For example, if a credit card is stolen, the cardholder can block the card, and – to a certain extent – the cardholder is not responsible for fraudulent charges.[12] The introduction of Chip-enabled Card Acceptance has further strengthened the protection against fraudulent behaviours. The protection is enforced trough the EMV security standard. The standard takes its name after the initials of consortium participants that developed it: Europay, MasterCard and Visa. Over the past decade, EMV has become the global standard for credit and debit card payments. EMV technology stores consumers' data on a chip which is significantly more secure than the magnetic strip card (magstripe) that preceded it.[13]

While EMV and other security measures have improved transaction safety and integrity over the years, card fraud continues to haunt cardholders and results in considerable financial losses globally every year. There are many variations of card frauds, with more common ones being:

- Stolen card details used for online and phone purchases
- Counterfeit cards used at a retail point of sale (POS) and ATMs
- Use of lost/stolen cards
- Fraudulent card applications

Figure 10: Growth in fraud vs. Total card volume worldwide



* Reflects currency fluctuations vs. U.S. dollars

(Source: The Nilson Report 2016)

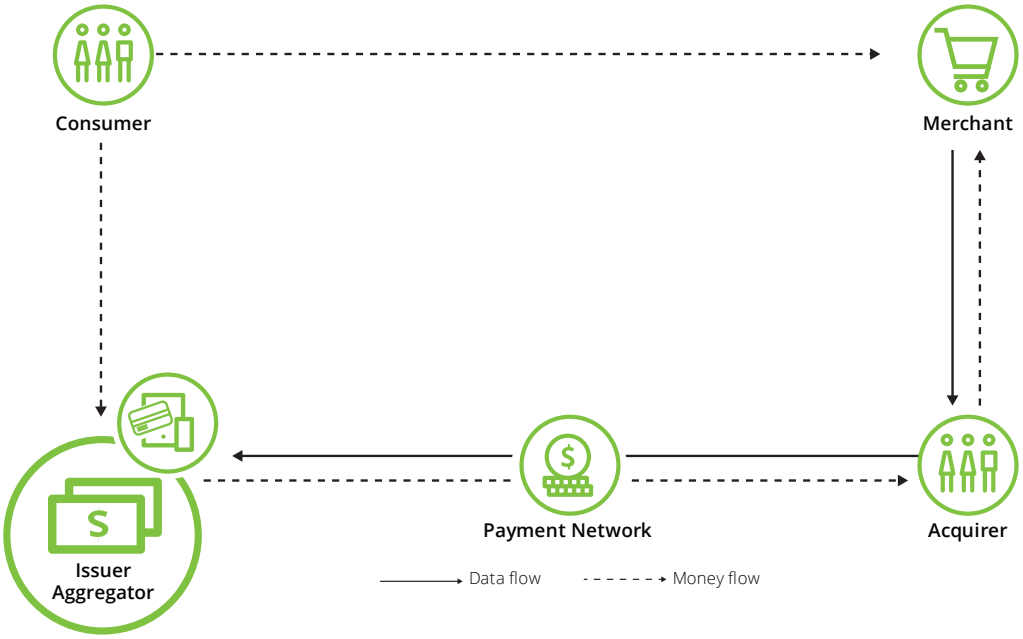
Globally, in 2015, gross losses accredited to card fraud alone amounted to US$21.84 billion. This corresponded to 6.97¢ per every US$100 spent. Forecasts estimate that by 2020, card fraud globally is expected to surpass US$31 billion.[14]

As a merchant, the main advantage to accepting card payments is that it increases sale volumes. The card acceptance also creates business legitimacy for a merchant as consumers tend to trust larger businesses that accept a variety of payment methods. Lastly, purchase funds flow directly into the merchant's bank account, as a payment is usually processed within two days.[15] However, a major disadvantage with card payments for merchants is that their profit margin is impacted by interchange fees incurred in the card transaction process.

Mobile payments using NFC

Smartphones and cards with Near Field Communication (NFC) capability provide consumers with payment methods that further push the boundaries of convenience and security. Apple Pay, Google Pay and Samsung Pay allow consumers to virtualise physical cards, and use their smartphones to process the card payment. By virtualising a number of different cards, these mobile wallets act as an issuer aggregator (Figure 11).

Figure 11: Mobile wallets by large technology companies, like Apple, provide consumers with ability to aggregate multiple cards



NFC allows two devices a few centimetres apart to exchange data. To process NFC payments at a POS, a consumer momentarily holds their NFC-enabled smartphone above an NFC reader. NFC significantly speeds up the payment process. A transaction is typically around 25% and 50% faster than cash and card transactions, respectively.[16]

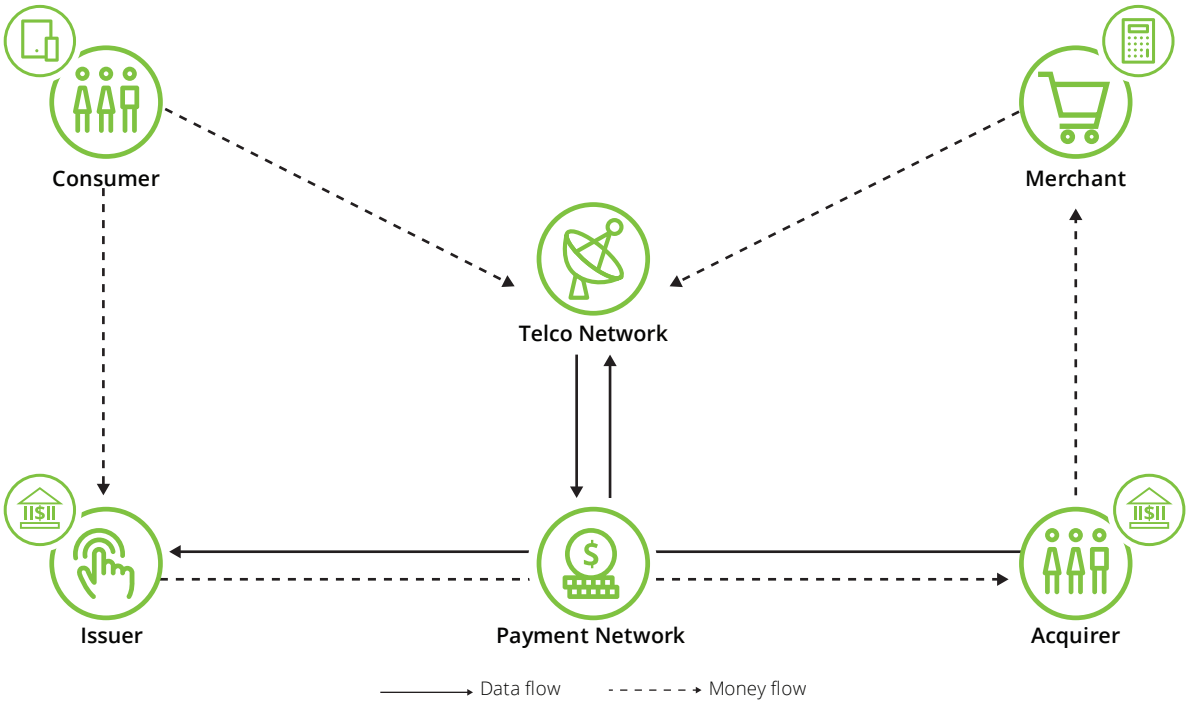
In addition, since there are only a few centimetres between the two NFC-enabled devices, the possibility of an unauthorised connection or third party access is virtually eliminated, significantly lowering hack-related security concerns. For merchants, NFC is an additional payment option they can offer to their consumers thus helping a merchant drive sale volumes and avoid cash handling costs.[17]

Mobile payments using USSD

Whereas NFC is only available on newer edition smartphones, most mobile phones – including feature phones – support Unstructured Supplementary Service Data (USSD), a telecommunications protocol that enables a mobile phone user to interact with services running on remote servers. As a result, USSD provides distribution of mobile financial services (MFS) on nearly any phone, at a low cost to a large target audience.[18] Bangladesh's bKash, Cambodia's Wing and Zimbabwe's EcoCash are examples of USSD implementation to bring MFS to consumers.[19]

Being readily available and simple, USSD protocol comes at price of security and user experience. USSD command requests can be relatively easily tampered by a malicious user through hardware and software interceptors. In addition, a USSD application on a feature phone can be easily misused in the absence of authentication protocols found in smartphones.[20] USSD usability is limited to a numerical keypad (0-9), and two special characters: a star (*) and hash (#) special characters.

Figure 12: USSD payments go through a telco network



QR Payments

Following its standardisation in 2000, it was not long before the QR Code was adapted as a channel for payment services. Since then, many traditional and new payment service providers have adopted QR Code as part of their payment channel. Key drivers for its fast adoption have been its low operating cost, versatility and the convenience it brings to consumers and merchants alike. At its bare minimum, the QR Code provides both consumers and merchants with an affordable and convenient payment service with no need to issue physical cards, tokens or Electronic Data Capture (EDC) machines. Consumers only need a smartphone app to make payments, while merchants will have a QR Code displayed at their checkout to accept payments. The low cost to deploy and operate makes the QR Code a very viable solution for merchants. At the same time, the availability of merchants with QR Payments makes it convenient for consumers.

As the QR Code is a way to encode data, there are two distinct ways in which they could be adopted to handle payments: to encode merchant data or to encode consumer data. A payment service provider could use one of these two options, or even both, in setting up their operating model. These two distinctions split QR Payments into consumer-presented and merchant-presented. In a consumer-presented QR Code, customers generate a QR Code that contains their payment information to be scanned by a merchant as illustrated in Figure 13. On the other hand, a merchant-presented QR Code contains payment distribution information to be displayed by the merchant for a customer to scan within their mobile app and initiate the payment for a purchase as illustrated in Figure 14.

Figure 13: Consumer-presented QR Code encodes payment credential information

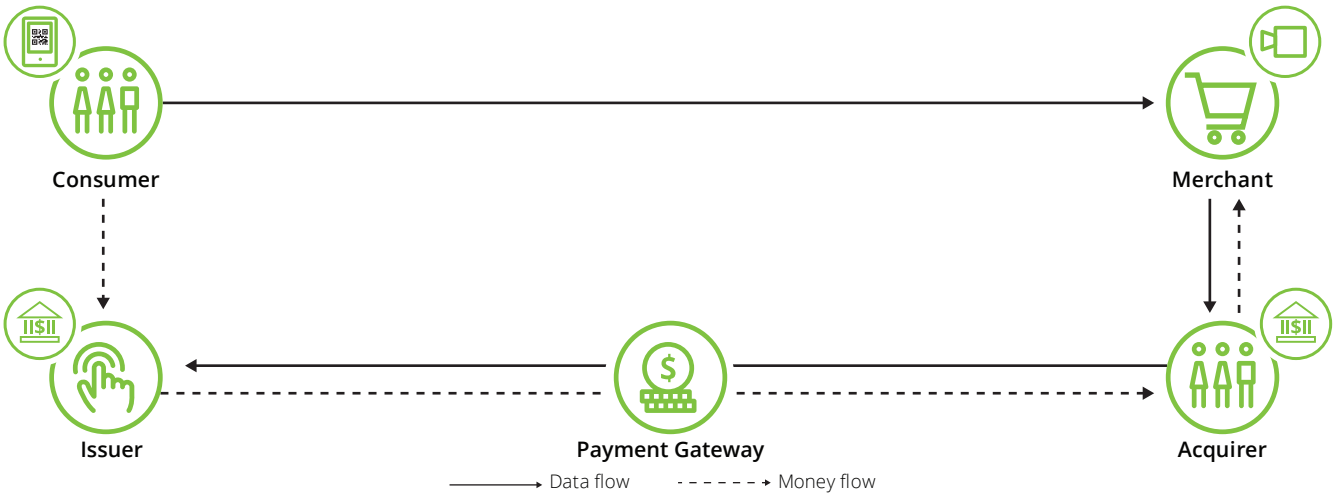
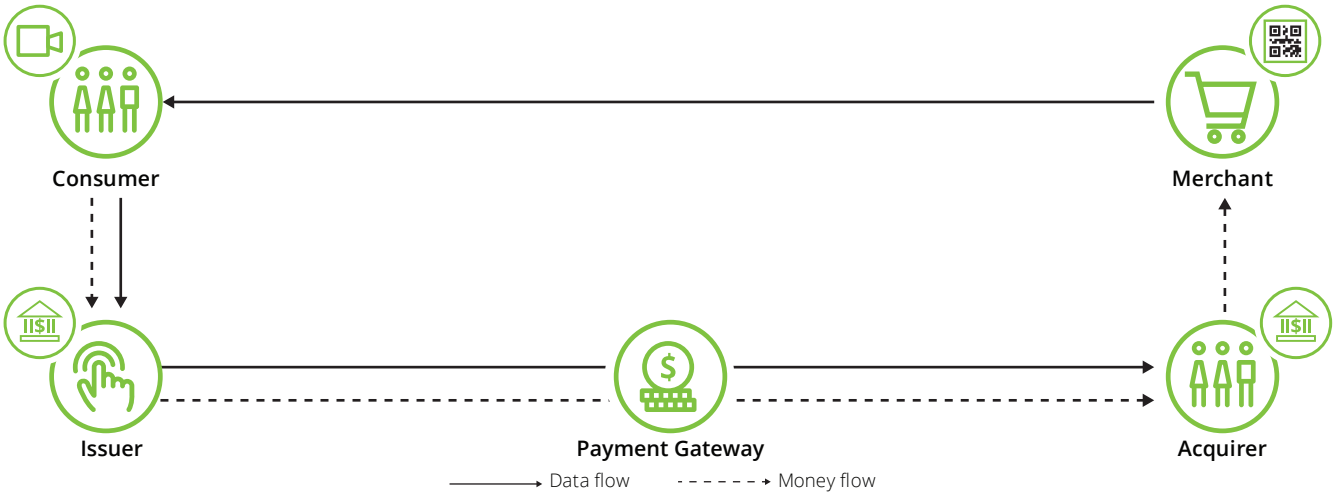


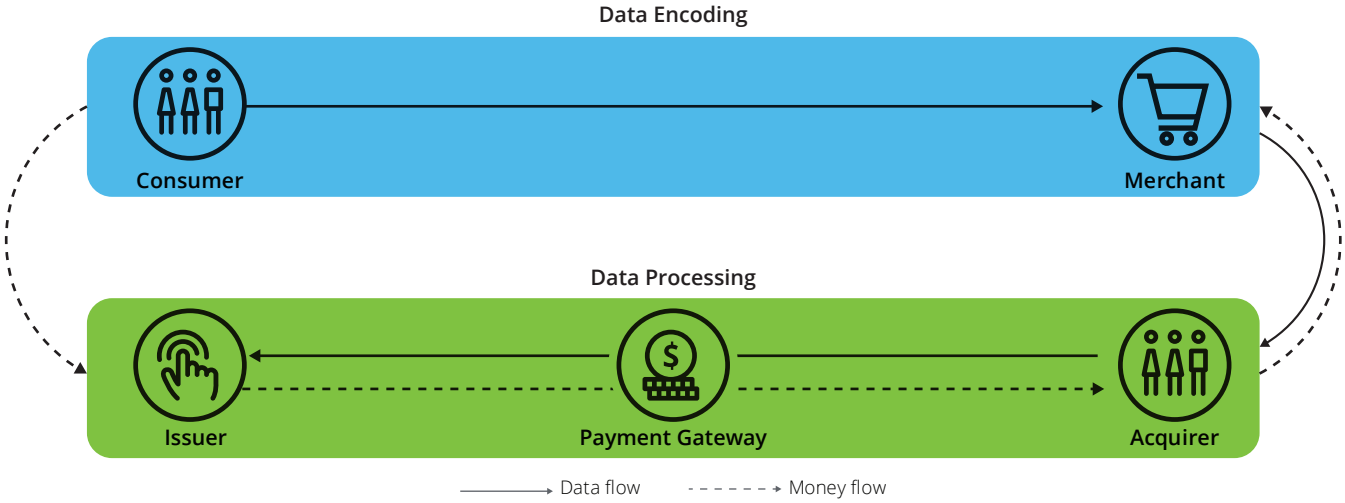
Figure 14: Merchant-presented QR Code encodes payment distribution information



Data standards for information exchange and processing

To process QR Payments, multiple independent and potentially heterogeneous systems must connect to communicate. This broad exchange of information requires participating systems to adhere to agreed information processing standards in order to understand each-other. The information processing standards can be categorised into data encoding or processing (Figure 15). Data encoding standards, govern how data is encoded within a QR Code. Only QR Code readers that employ the same standard can decode the data. Data processing standards govern transition and processing of payment data captured.

Figure 15: Two types of data standards across the payment model: data encoding at the front, and data processing at the back



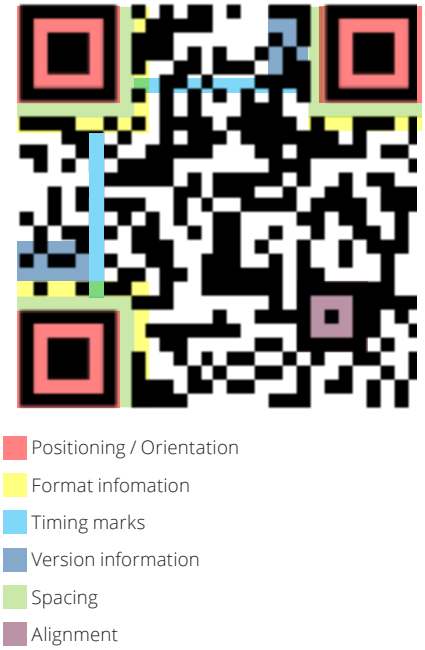
Data encoding for QR Payments typically consists five key business information elements:[21]

1. Payload format indicator
2. Merchant account information
3. Additional information on the merchant, such as the merchant name
4. Information on the transaction value, if known, such as the transaction amount
5. Additional data in support of various use cases, such as the bill number

In addition to the five business data elements, the QR Code contains metadata. Metadata is a set of data informing the QR Code reader how to read and interpret the business information encoded within the QR Code. It is this structured approach and robust metadata design that has enabled the extensibility of QR Codes and their appropriation across varying use-cases in different industries. Figure 16 depicts metadata segments within a QR Code.

Both data encoding and processing employ their own standards to support interoperability and security.

Figure 16: Make up for a QR Code[22]



Security concerns with QR Payments

Similar to payment methods prior to it, those with malicious intent have found ways to exploit QR Payments for fraudulent activities. The QR Code is designed in a way that intended them to be read by machines. As a result, humans are not able to discern the legitimacy of a QR Code just by looking at it. Hence, criminals can easily replace a QR Code with an illegitimate one to redirect payments to their own accounts instead. Smartphones are exposed to malware and this presents another security vulnerability that can be exploited. Other times, criminals steal consumers' QR Codes and use them to pay for products, not unlike with stolen credit cards. However, with maturity of the technology security mechanisms have been introduced to curb most exploitations, allowing the general public to have confidence in QR Payments and its applications.

Indonesia's payment landscape

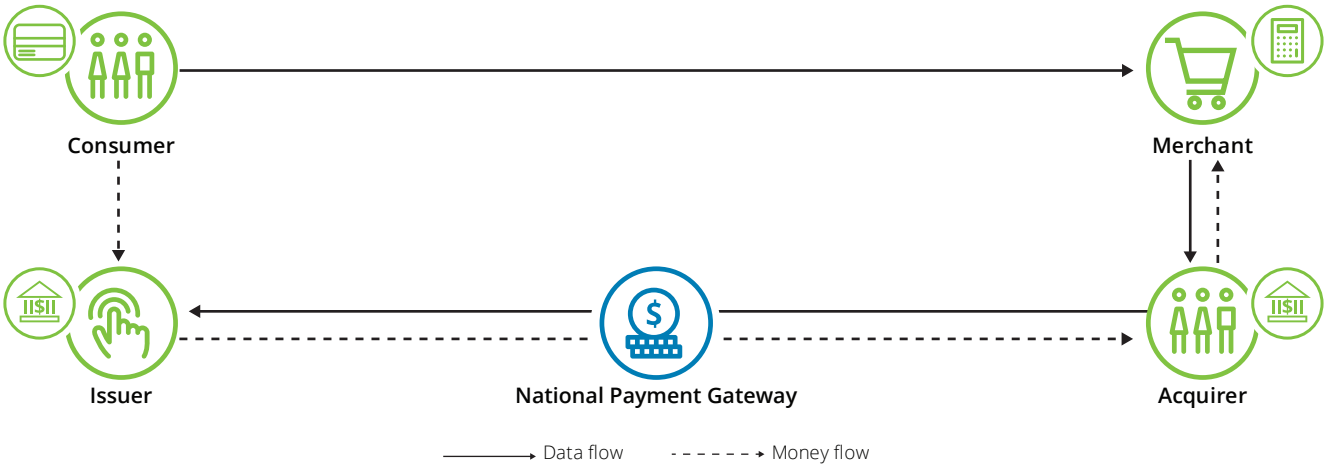
This section provides an overview of the current state of electronic and non-electronic payments in Indonesia.

Indonesia's diverse population has access to a variety of services offered by over 140 banks in the country.[23] The variety of choices mean that competing banks often employ different underlying technology or infrastructure that is not shared across the market. This creates interconnectivity and interoperability hurdles, and ultimately higher transaction fees for consumers and merchants.

In June 2017, Bank Indonesia, the country's Central Bank, launched the National Payment Gateway (NPG) as part of Indonesia's e-commerce roadmap series. NPG is a system built by the Central Bank to lay out the foundation to integrate and consolidate various payment vendors with the focus on interoperability. One key intent behind NGP is to increase cashless transactions at a more affordable cost.

NPG is made up of a consortium of four local interbank switching companies – PT Artajasa Pembayaran Elektronis, PT Rintis Sejahtera, PT Alto Network and PT Jalin Pembayaran Nusantara – known as PT Penyelengara Transaksi Elektronis Nasional. They jointly manage and operate the common payment infrastructure, depicted in the Figure 17.

Figure 17: National Payment Gateway (NPG)



Similarly to NPG initiative, four main e-money issuers – PT Bank Mandiri, PT Bank Central Asia (BCA), PT Bank Rakyat Indonesia (BRI), and PT Bank Negara Indonesia (BNI) – have signed the bilateral e-money interoperability agreement, which aims to reduce the transaction fees for using a non-issuing bank's card from 2-3% down to 1% for the infrastructure sharing.[24]

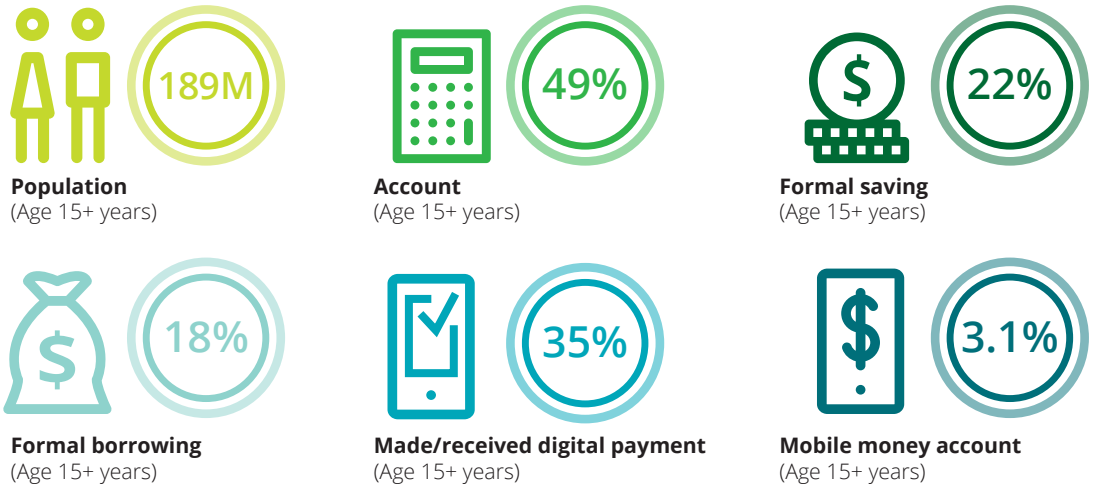
Between the 140 banks and e-money issuers in Indonesia, there exists a plethora of electronic payment options in the market. Table 5 in the appendix introduces different payment channels, transaction types as well as operator and member parties. Still, the strong preference for cash persists in the market, and the unbanked population is relatively high.

Underbanked Indonesia

Even with the perceived abundance of electronic payment options, the overall financial inclusion in the country is still relatively low. According to the World Bank Global Findex Database, in 2017, only 48.9% of Indonesian adults (15+ years) had a bank account. Although there has been significant progress over the past few years (36% in 2014, and 19.6% in 2011), it does not discount the fact that more than half of the population does not have access to basic financial services. For contrast, the banked Indonesian population of 48.9% is still considerably behind the world average of 69%.[25]

60% of the country's GDP is generated by 60 million small and medium enterprises (SMEs), of which the majority are micro, small and medium enterprises (MSMEs).[26] These small enterprises cannot afford the set-up cost for EDC POS devices, hence, inadvertently forcing consumers to pay by cash. This leaves both consumers and merchants without visible financial history and credit rating required for traditional banking services, further perpetuating the reliance on cash. The financing shortfall for Indonesia is estimated to be more than US$72 billion.[27]

Figure 18: Indonesia's financial inclusion indicators in 2017



(Source: Word Bank Research 2017)

The low level of financial inclusion in Indonesia presents opportunities for banks and new financial service providers to engage a previously untapped pool of consumers by providing novel financial products and distribution methods. Nevertheless, novel solutions to drive the financial inclusion are usually of digital nature, requiring consumers to own not just any phone, but a smartphone, which the unbanked may have difficulty owning.

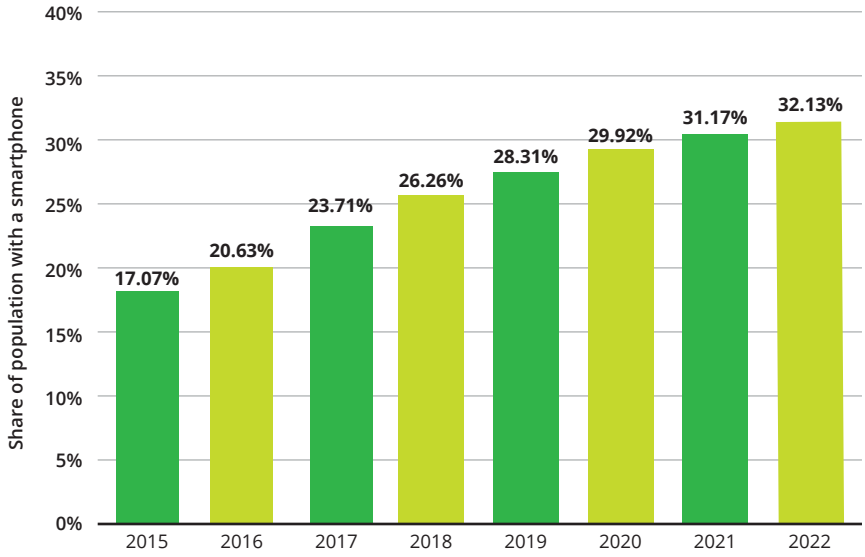
Smartphone penetration in Indonesia

Statistics indicate that Indonesia has been trailing in smartphone adoption with less than 25% of the citizen using a smartphone in 2017 (Figure 19).[28]

In comparison, China, the current leader in the QR Payments, shows a significantly higher smartphone penetration with over 50% adoption in 2017.

Globally, the overall smartphone shipments are stagnating, yet the percentage of midrange smartphones is increasing by 16% annually replacing the very low budget entry phones.[29] This indicates that we can expect more and more of 170+ million mobile subscribers in Indonesia[30] to own a smartphone, making the market increasingly more receptive to QR Payments.

Figure 19: Smartphone user penetration in Indonesia



(Source: Statista.com)

Transaction security and transparency

There is a rising concern in Indonesia regarding data privacy and consumer protection. A new cybersecurity agency was founded in January 2018 to provide protection for public and private institutions as well as consumers.[31] However, safety concerns may not be the only factor. The announcement made by the Indonesian government to track credit card payments for the purposes of tax evasion and money laundering prevention in 2017 resulted in a 10% drop in credit card transactions and doubling of the number of credit card cancellations.[32] While this reaction could have been driven by data privacy concerns, it does point towards high tax evasion concerns in Indonesia, which is promoted by the high use of cash. A 2017 World Bank study found that in 2016, 34.6% of Indonesians (aged 15+) made or received a digital payment. The study also revealed that 12.3% used a debit/credit card to make a purchase, 7.7% used a mobile phone to access an account and 11.2% used the internet to pay bills or purchase goods online.[33]

This leads to the conclusion that the acceptance of transparency that comes with electronic payments such as QR Payment systems and its successful roll out will depend on financial education, highlighting the benefits of a cashless society, and improving the trust in data privacy. More tangible benefits, such as tax incentives, could potentially help to promote the move towards going cashless.

QR Payment adoption

This section provides an overview and application of prevailing QR Payment standards in the United States, China, India, Malaysia, Singapore, Thailand and Indonesia.

United States

In the United States (U.S.), QR Code has been adopted by banks and payment channel companies as they see best fit within their business model. In an open market as such, the industry lookout is free-for-all with different players trying their own variant of payment schemes. From the government's perspective, the emphasis is not on how QR Code is employed, but rather on how payments are processed. There are laws in place to ensure that transactions are transparent and traceable, with minimum number falling under the radar. This helps to deter tax-evasion and anti-money laundering.

Payment via a QR Code did not initially gain traction in the U.S. However, the recent surge of Chinese tourists who rely heavily on Alipay or WeChat wallets has shown companies that there is a huge potential for gains in the adoption of QR Payments. This has led Walmart and EMVCo to venture into the foray of QR Payments in an attempt to find their winning formula.

Walmart implemented a QR Payment system on top of its Walmart Pay app. Using their smartphones, consumers can scan the QR Code displayed at the checkout screen and pay for their goods with the payment method they have stored on their Walmart app. The QR Code conveys the purchase transaction information to the application on the mobile device where the payment is initiated.

This keeps payment data safe in case of a security breach as the payment card information is not stored on the mobile device or at the register. Although it is a closed-loop payment system, Walmart saw significant growth in their sales with the use of QR Payment system, even fixing the use of Walmart Pay to exceed that of Apple Pay in the U.S. market.

Another key player in the U.S. market is EMVCo, a consortium which facilitates worldwide interoperability and acceptance of secure payment transactions. Its work is overseen by American Express, Discover, JCB, MasterCard, UnionPay, and Visa. EMVCo released their QR Payment standard in mid-2017 with an aim for global adoption. Customer-presented and merchant-presented QR Code standards were defined for open-loop payments to promote adoption, interoperability and reusability. It is important to note that the QR Code standards defined are only at the data encoding layer, i.e. the top layer in Figure 16 (refer to page 16). By defining only for the data encoding layer, the QR Code standard remains agnostic to the data processing layer below it. Apart from usage by the major payment networks who were already a part of the joint venture, the standards have been adopted as a blueprint by many countries, including Singapore and India.

China

The Chinese make up the largest user base for QR Payment in the world. The technology has penetrated society and tremendously changed the way people transact. There are lessons on how payment services have been employed, within China and abroad.

China at home

The story of China's emergence as a digital payments hub begins with key actors and the ideal setting: the growth of the Chinese middle class meant that more people could afford to buy smartphones, and this combined with improved internet connectivity and increased internet penetration led to the emergence of e-commerce. By December 2016, the number of Chinese people using the internet reached 731 million, just over 53% of the country's population.[34] These factors, along with the banking system's failure to meet the needs of the Chinese public and SMEs, provided the ideal conditions for disruption in the payments space. The number of Chinese mobile payment users reached nearly 470 million[35] and in 2017, China's mobile payments hit US$5.5 trillion, about 50 times the size of the U.S., which was at US$112 billion.[36]

As the wave of digital payments spreads, there exist a few concerns around security. More specifically, platforms such as Alipay and WeChat continue to hold risks associated with the transfer, collection, and storage of consumers' personal data. Initially, the development, evolution and spread of digital payments in China took advantage of lax regulations and a hands-off approach from the government. However, in mid-2017, the People's Bank of China (PBoC) passed a mandate for all electronic payments to be cleared through Wanglian, a clearing platform by the Central Bank, allowing regulators to monitor capital outflows and oversee transactions for money laundering and fraud.[37] Additionally, the PBoC also ordered caps on QR Payments. Depending on security measures and user credentials, the transaction caps are set at 500 yuan (US$77), 1000 yuan (US$154) or 5,000 yuan (US$769).[38] In 2017, 80% of all China payments were processed via non-banking platforms, and most of those via QR Payment.[39]

Despite the advantages of QR Payments in bringing about financial inclusion and optimising the construction of non-cash payment environment in China, the problems ranging from compliance to security and fraud were burning issues that the PBoC needed to address. The regulatory landscape in China has traditionally been reactive: learning from the market response, adoption, and security issues, rather than developing regulations in anticipation of new technologies and disruptors. Similarly, PBoC stepped in to define QR guidelines only after the rapid expansion of QR Payments. In August 2016, the PBoC officially authorised the Payment and Clearing Association of China (PCAC) to work with its members, which included banks, existing QR Payments services providers (e.g. Alipay & Tencent) to develop rules for QR Payments and perform public comment procedures. Through working with businesses, PCAC was able to have a better understanding of the technical and business standards, managing personal information and storage of sensitive information, capital security, and encryption measures.[40]

The Central Bank together with PCAC set out to balance between encouraging and standardising financial innovation while also maintaining a fair and competitive market environment, promoting sustainable development of the payments industry, and preventing associated risks with QR Payments. The PBoC developed a policy in relation to barcode payments that came into effect on 1 April 2018. The policy addresses daily consumer transaction limits, QR Code encryption, transaction verification, user information protection, and enforces each QR Payment to be settled via a newly formed QR Code clearing house supervised by the Central Bank.[41]

The relaxed regulation and the resulting freedom given to FinTechs in the early stage of QR Payments played a key role in its fast proliferation, culminating with the significant distribution of the Chinese payments market. Eventually, with QR Payment systems reaching market maturity, there was a greater need for the regulating body to focus more on consumer protection and data privacy. This added governance oversight at the mature stage helps to promote consumer confidence and trust in the already established market without hampering momentum towards financial inclusion and the establishment of a cashless society.

China abroad

In 2016, Alipay began pushing its services internationally. This global expansion was driven by the mission to enable cashless experience that its consumers enjoy at home while abroad as tourists and students. One of its first international implementations was with Finnair, Finland's national airline. Alipay integrated with Finnair to allow the use of Alipay for inflight payments. This was then followed by purchases at airports, restaurants and hotels in Finland. To make this work, Alipay worked with a Finnish local payment partner, ePassi, and the Finnish Tourist Board.

ePassi connected their own payment gateway to Alipay to enable Alipay transactions for their existing merchant network. ePassi manages merchants via their own gateway as well as the integration into the merchant's POS.[42] Transactions are processed by scanning the consumer's QR Code presented on a smartphone and routed via Alipay's application programming interface (API) to Alipay's systems. Once the payment is processed, the consumer and merchant will receive confirmation in their app and POS device, respectively. The merchant then receives the payment amount in their bank account within 2-3 days.[43] The responsibility of the Know-Your-Customer (KYC) process is also split amongst the partners, with ePassi responsible for merchants' onboarding, and Alipay for the onboarding of consumers. All parties benefited from the partnership: Alipay increased the number of transactions for its users while abroad, and therefore its fee revenue and user insights; ePassi improved its merchant coverage in Finland, with the large and increasing number of Chinese tourists visiting the country. Alipay went on to become the biggest mobile payment operator in Finland with a market share of 30%. For Chinese tourists, the cooperation provides a cashless convenience and familiar payment experience, making Finland a very attractive country to visit. These factors contributed to a three-fold increase in tourists visiting Lapland in Finland in just two years. Finally, in January 2018, Finland became the first country to provide a completely cashless experience for Chinese visitors as demonstrated by an experiment where eight tourists visited Finland for a cashless vacation.

The cooperation between Alipay and ePassi is a good example of how QR Payment systems are able to promote a cashless society even beyond country borders. By pushing the expansion of these partnerships into different countries, Chinese tourists and students continue to experience cashless convenience at more locations around the world.

India

At the turn of the century, India was stepping into its own as a regional leader with nuclear capabilities and attention from across the globe as an outsourcing hub for highly skilled workforce. However, there still remained a disparity in the distribution of wealth with over 400 million people living below the poverty line. This was a staggering number, representing over 40% of the population at the time. The governor of the Reserve Bank of India highlighted financial inclusion as a necessary step in the battle against poverty for the country in 2005. Efforts on that front culminated in late August 2014 when Narendra Modi, the Prime Minister of India at the time, launched the Pradhan Mantri Jan Dhan Yojana (PMJDY) or the National Mission for Financial Inclusion. With financial inclusion as its major driver, a number of rules were introduced to make banking services more accessible to the masses.

Prior existing schemes, such as simplified KYC requirements for opening limited 'Small Accounts' which could be done by any persons without the need of a valid identification, were combined with the new PMJDY scheme giving the banks an incentive to proactively open accounts for the unbanked. The success of these initiatives is evidenced by the fact that the total number of bank accounts across the nation more than tripled within a year: from US$53.7 million in September 2014 to US$185 million in September 2015.[44] In terms of the population percentage, the number of Indians older than 15 with a bank account rose from 35% in 2011 to 80% in 2017.[45]

As impressive as the success in financial inclusion is, it came about as a result of a culmination of a number of initiatives rather than just PMJDY alone. Earlier in 2010, the Indian government had introduced the Adhaar identification card, a unique form of identification to identify each citizen and verify them using biometric and demographic data. Adhaar had reached the 93% adoption by the late 2015, and it has provided the key KYC identification for opening new bank accounts since its introduction.

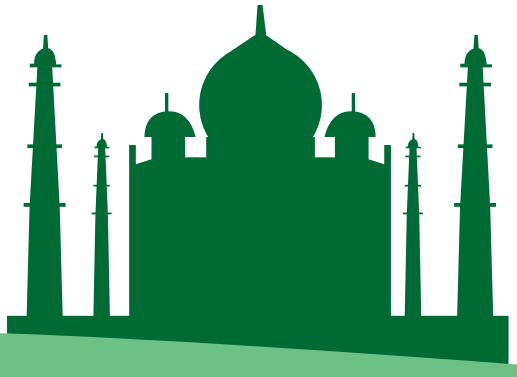
Another major contributor propelling India towards a cashless society and promoting financial inclusion was the introduction of the National Payments Corporation of India (NPCI). The not-for-profit company owned by a consortium of major banks was formed in 2008 with the objective to drive innovation in payments. The government introduced initiatives developed by NCPI starting with IMPS, an Immediate Payment System for interbank transfers, in 2010. Subsequently, NPCI efforts resulted with payment products such as the United Payments Interface (UPI), Bharat QR, Bharat Bill payment system, amongst others:

- UPI is a payment interface that allows transfers between banks on a mobile platform. UPI was a standard that bridged bank accounts to other identification platforms like the Aadhar number or mobile phone numbers, and made it possible to transfer using USSD and QR Code.
- Bharat Interface for Money (BHIM) is one of the many mobile apps for processing UPI payments. The app is used for both peer-to-peer and consumer-to-merchant money transfers.
- Although Bharat QR was developed in collaboration with EMV members, MasterCard, Visa and American Express[46], the two standards are not compatible. Bharat QR enables cashless transactions through the use of UPI, debit or credit cards. It debuted in September 2016, months prior to EMV launching their own QR specifications in July 2017.

Prior to the introduction of Bharat QR, only a limited number of merchants in India accepted card payments due to the lack of payment infrastructure, and QR Payments were constrained to semi-closed loop operators such as Paytm, Freecharge and Mobikwik.[47] With Bharat QR, every merchant can easily accept a variety of digital payments straight into their bank account. Without the need for connectivity, and by printing their merchant identifier as a Bharat QR Code and displaying it at the POS, a merchant can accept mobile payments from any UPI-supported app (WhatsApp, Google Tez, etc.) or Bharat QR-supported banking app. If a consumer uses an UPI-supported app, the UPI interbank payment network is used to process money transfer. For banking apps, the money transfer is processed via the Visa, MasterCard or RuPay network, depending on a consumer's selected card of choice for the payment.

When the Indian government announced demonetisation of the 500- and 1000-Indian Rupee (INR) notes in late 2016, the infrastructure was ready for the country to progress towards a digital society. UPI saw rapid growth in usage, processing 416 million transactions worth INR566 billion (US$8.2 billion) in 2017 and 691 million transactions worth INR858 billion (US$12.4 billion) in the first four months of 2018 alone.

Overall, the Indian government's initiatives drove financial inclusion, interoperability and innovation. The government successfully balanced deregulation of the requirements on KYC and at the same time, set up standards and platforms that keep the market open to all players.



Malaysia

In 2010, Malaysia's Central Bank, Bank Negara Malaysia (BNM) developed a "Financial Sector Blueprint 2011-2020" which charts the future direction of the financial system over 10 years. The blueprint highlighted electronic payments as one of the nine key focus areas and since then, BNM has been working to accelerate the migration to e-payments, moving towards a cashless society and broadening financial inclusion.[48] QR Payment has been identified as the catalyst towards achieving that goal.

BNM has been working closely with Payments Network Malaysia (PayNet) to develop an Interoperable Credit Transfer Framework (ICTF) with the aim of levelling the playing field, where banks and non-banks will have open access to a system that settles payments or facilitates transactions. The initial ICTF draft, including a view on QR Payments, was released for public consultation in December 2017.[49] PayNet – an organisation collectively owned by BNM along with eleven of Malaysian's financial institutions – will serve as the operator of a shared payments infrastructure for the nation. Given BNM's support of creating a cashless society, several players have started piloting and exploring the use QR Payments in Malaysia, notably Alipay, GrabPay, Maybank QRPay, MOLPay, TaPay and WeChat Pay.[50] In order to ensure consistency in its application whilst awaiting the completed ICTF, PayNet released a high-level policy on QR Code standards that highlights QR data objects, naming conventions, and details of merchant account information.

The broader content of the ICTF will look to streamline the numerous QR Code-based digital wallets thus making QR Code displayed for payments platform agnostic. PayNet is also exploring regulations to set limits for transactions and additional KYC for larger transactions in order to counter fraud. Additionally, the framework will address the cost of transaction fees to make it more attractive for individuals and SMEs to adopt this method of payment.

Although the standards were first adopted by Maybank with the release of their integrated QR Payment app in January 2018, how the Malaysian market adopts the technology is still to be seen.

Singapore

Singapore is scheduled to roll-out the new standards for QR Payments progressively throughout 2018. In November 2017, the Monetary Authority of Singapore (MAS) announced the endorsement for a common Singapore Quick Response code (SG QR). The SG QR will be deployed by local payment service providers and it will be compatible with electronic payments, e-wallets and banks. SG QR is EMVCo compliant, yet customised for Singapore.[51]

Led by MAS and Infocomm Media Development Authority, the SG QR was developed in consultation with traditional payment providers as well as FinTechs providing QR Payments in the market, like EZi Technology, Liquid and Fomo Pay. To collaboratively develop a common QR Code for Singapore, MAS set up the taskforce.[52]

SG QR will maximise the number of e-payment schemes by enhancing the efficiency of processing merchant data. Payment service providers are developing a more seamless onboarding process for QR options as well as a governance structure for various payment schemes that will ultimately be incorporated into SG QR. This will be applicable to merchants already accepting QR Payments.

SG QR will be replacing the initial efforts for QR Payments in Singapore led by NETS, the country's electronic payment provider. NETS will issue their existing 30,000 QR enabled merchants with an updated QR Code that is SG QR compliant.

All the major payment providers already incorporate QR Payment within their mobile apps, whereas PayNow ensures interoperability between the apps. PayNow, launched in mid-2017, is a Singapore government initiative that enables money transfers using a proxy identifier for a bank account number. For the proxy, individuals can use their mobile phone number or national identity number, and the plan is for businesses to use their business registration number.[53] Moreover, by end-2018 PayNow will be included as part of SG QR for peer-to-peer (P2P) fund transfers.[54]

Considering its well developed country infrastructure and smartphone penetration rates exceeding 75%, Singaporeans still heavily relay on cash.[55] In a 2017 survey, 90% participants indicated cash as the preferred payment option, with small percentage only using digital payments regularly.[56]

Following the EMVCo approach to standardise QR data encoding, Singapore is hopeful that increased consistency in the payment experience for both consumers and merchants will help accelerate its own path towards the cashless society and Smart Nation ambitions.

Thailand

The Thai government rolled out the PromptPay national e-payment initiative in early 2017 with the objective to drive the country towards a cashless society, increase financial inclusion, improve trade transparency, minimise tax evasion, and evaluate its social welfare policies.

As traditional interbank money transfers in Thailand cost the transferring party upwards of THB25 (US$0.80), PromptPay was launched with a clear adoption incentive by providing a channel for free interbank money transfers on transactions up to THB5,000 (US$159) in value.

PromptPay is a payment channel that allows individuals and businesses to receive money into their bank account using the recipient's mobile phone number or Citizen ID or the Tax ID of a company/vendor. As such, an active bank account is a prerequisite to using PromptPay.

Banks facilitate PromptPay registrations through their existing channels: branches, ATMs, websites and mobile apps. During registration, a user is prompted to select their phone number(s) or citizen ID number with the chosen bank account. Non-Thai citizens, who are Thailand residents, are also eligible for the service, by linking their Thailand mobile phone number to their bank account. Businesses can associate their Tax ID to their bank account to receive the same benefits.

The government has been encouraging PromptPay adoption by paying out social benefits and tax refunds to their citizen ID-associated PromptPay accounts. Additionally, users are able to generate a Request-To-Pay (RTP) for any amount via PromptPay. PromptPay is an open-loop system that can be associated with a bank account from any bank within the Thailand. PromptPay currently only operates at a national level with laws issued by the Bank of Thailand (BoT), the central banking authority of Thailand, to make sure all banks provide consumers access to the service. At the Singapore FinTech Festival in November 2017, MAS announced the linking of PayNow, a sister-initiative in Singapore, with PromptPay.[57]

As PromptPay is available only to consumers with a bank account, KYC is performed by banks as part of their customer onboarding. There is no mechanism for searching users or numbers and only those with knowledge of a destination mobile phone number or Tax ID number can make a transfer.

The fruits of the government's policy in driving the adpotion of PromptPay can be seen through the numbers. As of March 2018, 14 months since its launch, the service saw a subscription of 12.6 million mobile phone numbers, 26.7 million citizen ID numbers and 127 million transactions worth THB490 billion (US$15.6 billion) transferred. Of the subscribers, 11 million were recipients of the social benefits for the poor. In addition, 50,000 businesses had signed up to receive payment via PromptPay as of January 2018.

Individuals with PromptPay can set up a unique QR Code with encoded data. Users of a mobile banking app can scan the QR Code and transfer money to the individual's PomptPay account instantly. This is in line with BoT's initiatives to promote electronic payments and drive the National e-Payment Master Plan.

BoT announced an initiative to collaborate with major payment card network providers as well as different associations representing the local and international banks, telecommunications firms, government and the Thailand Electronic Payment Association (which was founded by 16 FinTech companies) to adopt a Thai QR Code standard for payments.[58] This was done via BoT's regulatory sandbox, in which aspects such as readiness and robustness of IT system, risk management, consumer protection, security, as well as related operations in their branches and call centres of a proposed payment solution have to be verified before the solution hits the market.[59]

The standard and policy developed by the Thai QR Code Working Group governs the end-to-end QR Payment processing; this includes all technology aspects of data encoding and payment processing to maximise the interoperability and accuracy of the payment transactions. Another big focus was on consumer protection.

In November 2017, BoT allowed five major banks to graduate the QR Payment solution from the regulatory sandbox and take it to market, with the promise that more banks in the sandbox will also follow.[60]

Indonesia

Similar to other country examples given in this section, Indonesia has been promoting the cashless agenda and improving financial inclusion. The national non-cash payment movement was launched by Bank Indonesia in August 2014, and currently the market is in large encouraged to explore their own appropriation of QR Codes and to innovate.

Given the size and population of the country, it comes with no surprise that of all the FinTech companies in Southeast Asia, 20% are based in Indonesia.[61] This makes Indonesia the runner-up in number of FinTechs in the region, second only to Singapore. Between 2013 and 2017, FinTechs in Indonesia raised a total of US$56 million in funding.[62] The impact was over 940 million e-money transactions worth IDR 12,375 billion in 2017 alone.[63]

While carrying out the research for this paper, we had the privilege to interview key executives from four of Indonesia's leading FinTechs and one bank from March to June 2018. Our participants included leaders in QR Payments and today, processes a majority of Indonesia's cashless transactions. Below are some key themes identified during our discussions, describing their unique QR Code use-cases, and perspectives towards the goal of achieving Indonesia's status as a cashless society and promote financial inclusion.

OVO

Setiawan Adhiputro
Director of Regulatory and Industrial/Government Relations

OVO, a member of the real estate Lippo Group, started off as the mobile app for loyalty programme for merchants within Lippo-owned shopping malls across Indonesia. Today, OVO's app has matured to offer cashless payment services.

OVO's loyalty programme uses QR Code to capture information on a consumer's identity. At a participating merchant, consumers present their QR Code that is scanned by a merchant. Upon scanning the consumers' QR Code and processing a payment, the consumers' account is credited with the points earned and the transaction data is stored in the account. The points earned are then redeemed by consumers for goods and services at participating merchants, and the transaction data is analysed to better understand customers and their individual habits and preferences.

OVO's current focus is to grow the loyalty customer base to beyond mall shoppers. Setiawan has identified partnerships with other payment providers as the key to their growth. The interoperability between different payment providers in the market is key to enabling OVO's growth.

OVO's approach is to empower the merchants first. The loyalty programme helps increase the consumer footfall for participating merchants, while an analysis of shopping data can help reveal information that will help merchants better cater to their customers' individual needs through personalised services and offers. Moreover, the cashless payments system helps elevate merchants' overheads associated with cash handling and book keeping.

Setiawan shared OVO's merchant classification according to whether they are likely to use static or dynamic QR Code:

1. **Traditional Merchant:** An example is a small SME where a static QR Code is used due to lack of infrastructure

2. **Modern Unorganised:** An example is a medium to large SME where either a static or dynamic QR Code is used, depending on merchant's preference

3. **Modern Organised:** An example is a large SME or an Enterprise, with established infrastructure where a dynamic QR Code would be the most appropriate

GO-JEK

Budi Gandasoebrata
Chief Risk & Compliance Officer for Go-Pay

Most Indonesians – and many across Southeast Asia – would need no introduction to GO-JEK. One of the true unicorn start-ups in the region, GO-JEK's story is one of the organic evolution of services based on consumers' evolving needs, and the mission to empower partner drivers to be more efficient through technology.

Initially, GO-JEK started as a motorbike hailing service. It was a common custom in large Indonesian cities to pay for a bike ride, and GO-JEK made it more convenient and safer through the use of the mobile app. Bike riders had to be registered and onboarded with GO-JEK, a transparent process that gave riders legitimacy and boosted consumer's confidence and trust in the ride.

Soon thereafter, from helping move commuters through congested traffic, the GO-FOOD service was added to the app. GO-FOOD initially required riders to use their own cash to purchase food on behalf of consumers. The driver had to blindly trust that once the food was delivered, the consumer would pay for it. This was not always the case and so the GO-PAY service, an in-app digital wallet, was launched for all payments within the app ecosystem to solve this problem. GO-PAY's key objective was to protect the drivers so they do not have to risk spending their own money. With GO-PAY in place, once the food was delivered, the payment balance would be transferred from the consumer's mobile wallet to the food merchant's, keeping the driver out of the payment model.

Using GO-PAY credit for off-line purchases was the next evolution of the service. GO-JEK was granted the QR Payment licence in May 2018[64] and its 400 operations staff are now busy onboarding merchants, all keen to serve GO-JEK's large consumer base, through the KYC process. These days, the GO-PAY QR Code can be utilised in a wide-range of merchants; from international coffee franchise to roadside stalls and even donations through the government-owned BAZNAS (Amil Zakat National Agency).

Budi highlighted the importance of QR Code scalability. The QR Code is a reliable data encoding mechanism and it is relatively inexpensive, requiring only a printer and a piece of paper to onboard a qualified merchant. This makes the QR Code an appropriate tool to reach the hundreds of millions MSMEs in Indonesia.

Once a merchant starts accepting GO-PAY QR Payments, they provide the convenience of frictionless payments to GO-JEK's large consumer base while simultaneously developing a traceable transaction history. The merchant then can leverage their transaction history to apply for a working capital loan from a bank. This is in line with GO-JEK's experience in developing the Swadaya programme, in which they partner with banks to facilitate financial access for existing drivers and merchants who previously had been unbanked or underbanked. Some examples include a partnership with Bank Tabungan Negara (BTN) to facilitate subsidised mortgage for drivers; and a pilot project with BNI to disburse KUR (Kredit Usaha Rakyat, a government subsidised working loan) for GO-FOOD merchants. GO-PAY hopes to be a bridge for unbanked communities to access formal financial services.

Still, onboarding merchants requires consistent education, due to the prevalent preference for cash. To many, e-money does not seem as safe or as real as actual cash. Also, it seems more expensive to process: digital transaction records are exposed to taxation, and it comes with a transaction processing fee.

Even more challenging is finding use-cases for cashless payments in rural areas. Budi points at GO-JEK's intimate knowledge of the local culture as key in helping make progress in this area. An example is Mapan, GO-JEK's acquisition in late-2017.[65] Mapan is an app that allows local communities to save money together for a shared purchase.

Even though GO-JEK is a technology company, Budi stressed that enabling the society where cashless payments are the first choice for the people, something akin to China, is not as much about technology as it is about operations and collaboration. The industry as a whole needs to work closely together in a partnership to push for interoperability and better anticipate and serve market needs.

Dimo Pay Indonesia

Ari Awan
Chief Technology Officer

Unlike OVO, Grab, and Go-JEK, which largely focus on the consumer, Dimo Pay Indonesia operates a business-to-business model focused on enabling QR Payments in their partners' digital wallets. Dimo achieves this through its 'Pay by QR' product. The issuer's digital wallet integrates 'Pay by QR' capability to read a merchant-presented QR Code, and then process the payment.

Dimo's roots are in cashless payments. It started as a software company for EDC terminals used to process card payments. This proved beneficial when it came to extending the capability of merchant's POS devices to display QR Codes. Today, Dimo enables 24 digital wallet issuers to process cashless payments across more than 3,000 merchants for two million consumers.

Merchants present consumers with a dynamic QR Code displayed via a traditional POS device, or on a smartphone. Once the consumer scans the QR Code, the payment balance is debited from a digital wallet balance and credited into merchant's bank account. Currently, Dimo's KYC process requires merchants to have a valid bank account.

Dimo's goal is to continue onboarding merchants as fast as possible and flood the market with QR Codes in order to make cashless payments ubiquitous.

Ari, similar to our other FinTech interviewees, pointed at the importance of interoperability towards realising Indonesia's cashless agenda and achieving financial inclusion. Towards this goal, Dimo plays a unique role as it is operating an open loop system for QR Payments. By using the 'Pay by QR' across diffident digital wallets, consumers can push cashless payments at participating merchants. Merchants benefit from being able to serve consumers with digital wallets from different issuers with only one type of QR Code.

Ari believes that there is still more to be done. He indicated the importance of education to improve nation-wide financial literacy, and the need for better telecommunications infrastructure for improved coverage, responsiveness, availability and reliability as the key enablers towards creating a cashless society and improving financial inclusion. He concluded that Dimo will continue to broaden its reach and is keen to work with the National Payment Gateway on standardisation and interoperability of QR Payments in Indonesia.

Yap!, Bank Negara Indonesia

Anang Fauzie
General Manager, Electronic Banking Division

BNI launched Yap!, its new mobile app, at the beginning of 2018. The app serves as a vehicle of the bank's dual mission: to do well as a business, and to do well as an agent of development for the Indonesian government.

As part of the government's development programmes, BNI ensures that the rightful subsidy entitlement is correctly and securely distributed to more than seven million residents, out of which three million are farmers. To this cause, it leverages its KYC, record-keeping and distribution infrastructure.

Currently, each individual on the government subsidy programme is issued an e-wallet card that contains their savings account balance, as well as the subsidy entitlement balance. Moving forward, e-wallet cards will be gradually replaced by Yap!. The app's functionality roadmap is aligned with this, and it targets to meet expectations of multiple customer segments.

In addition to incorporating the e-wallet card for the government subsidy, Yap! will support two types of cashless payments: e-money, which does not require bank account; and card payments targeted for middle-upper customer segments. All users will also will be digitally authenticated through the app.

BNI sees Yap! as the driver of increasing financial inclusion and establishing a cashless society, especially through its ability to enable better financial services for small business operators – the micro-merchants – throughout Indonesia. Currently, BNI has 135,000 merchants in its network out of which more than 45,000 have already adopted Yap! within three months since its launch.

Similar to a FinTech, BNI aims to continuously bring added value to Yap! users through payment interoperability and ecosystem play with a focus on bringing financial services to rural areas. To this aim, Anang, prioritised two key enablers:

- Continuous educational efforts to improve financial literacy of merchants first, and then consumers; and
- Close collaboration with Otoritas Jasa Keuangan (Indonesian Financial Services Authority) and the Central Bank, as well as the better integration with Dukcapil (the national civil registry institution) to support fully electronic KYC for a faster and easier bank account opening process.

The interviews with our participants clearly indicate that while they all have a somewhat competitive agenda amongst them, there is a common theme and agreement on the need for a closer collaboration across all parties in the payment ecosystem to improve financial infrastructure and literacy.

As more banks and payment providers – both incumbents such as MasterCard and Visa, and new comers such as FinTechs – look to introduce their own QR Payment solutions, Bank Indonesia has initiated work on the QR Payment standards and regulations. Similar to examples we have seen from Singapore, Thailand and India, Bank Indonesia formed a working group for QR Payments.[66]

The working group includes Bank Indonesia together with the Indonesian Payment System Association, also known as Asosiasi Sistem Pembayaran Indonesia (ASPI). ASPI comprises 136 members, out of which 115 are banks and 21 are non-banks.[67] Currently, none of the four Fintech participants in this study – the leading QR Payment providers – are ASPI members.

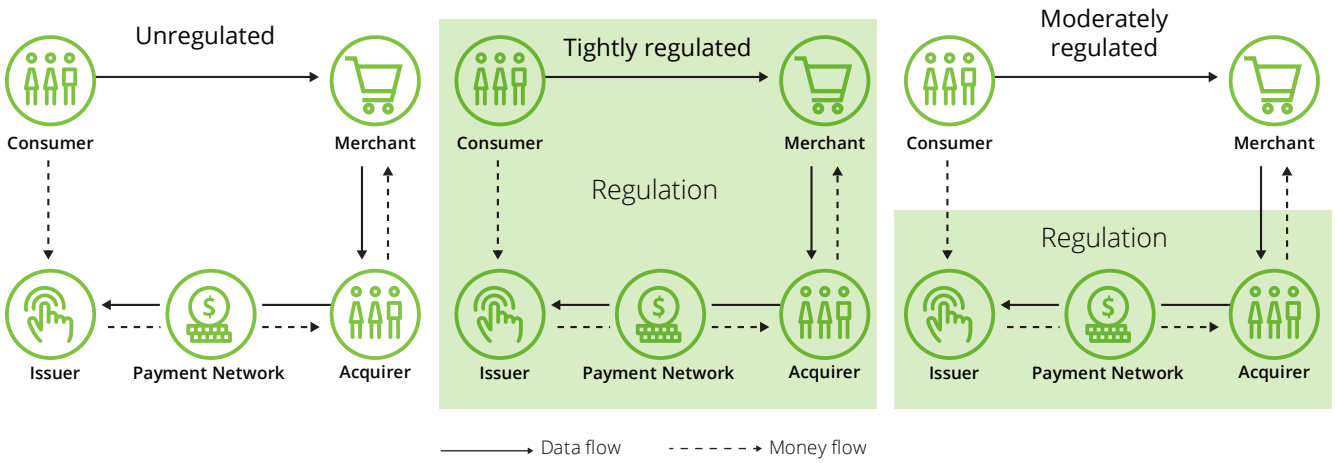
Scenarios exploring causality between regulation intensity and propensity towards financial inclusion

Promoting financial inclusion and a cashless agenda is a balancing act between regulation and innovation, and between competition and collaboration. Here, we introduce three possible scenarios that could play out for the payments industry in Indonesia, each exploring different points on the regulatory spectrum.

Three scenarios, described next and depicted in Figure 20, hypothesise regulatory effects on the speed of progress towards improving financial inclusion and establishing a cashless society in a financial market. The scenarios differ in a focus and intensity observed by regulations, and consider the market implications across number of dimensions.

In the first scenario, a QR Payment market is described within a low regulatory intensity across the payment model. The second scenario is the opposite, with the high regulatory intensity across the model. Lastly, the third scenario looks for the "Golden Middle": balancing between the higher regulatory intensity on payment processing part of the model, while encouraging the innovation at user interaction part of the payment model.

Figure 20: Three scenarios exploring regulatory implications on speed of financial inclusion and cashless society



Scenario 1: An unregulated market

An unregulated electronic payment market operates under a governing body that has yet to get involved in setting the controlling regulations to drive a specific agenda. The innovation is open, and the exploration of novel ideas is encouraged and free for all. This allows the market to self-steer as companies compete and innovate to provide convenience and solve consumers' problems. The relaxed regulatory oversight has different ramifications for different players in the industry.

Most countries have remnant laws passed in the 20th century to regulate the financial industry. The focus of these laws was largely to control entrants into the banking sector in order to minimise money laundering and fraud. Today some of these 'legacy' constructs and processes restrict user experience with a certain level of complexity that could be optimised in the 21st century and the age of digital.

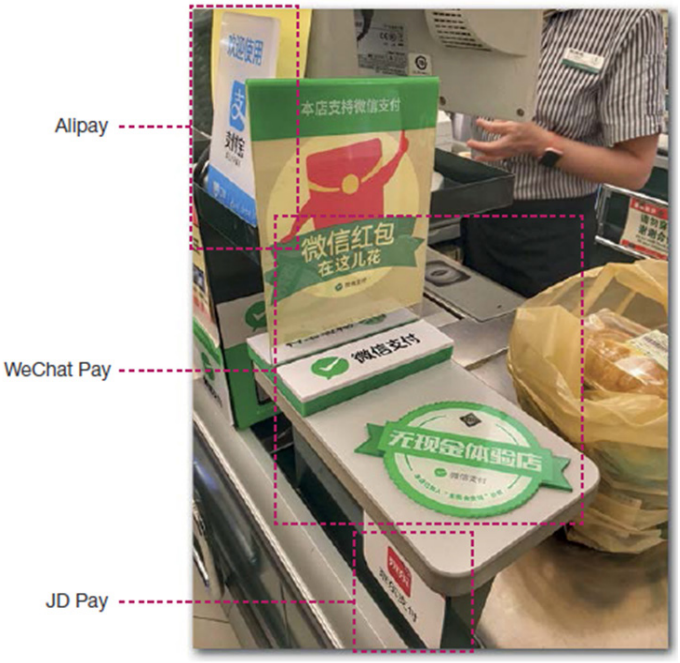
The constraints brought about by 'legacy' financial regulations provide innovation opportunities for new market entrants, the FinTechs. The advent of digital technologies made it possible for newcomers to provide products and services in a manner and velocity that incumbents find difficult to match. A greater level of innovation is observed in such markets as companies have the freedom to try and adopt emerging technologies faster.

Given the increasing number of FinTechs, both merchants and consumers have more flexibility in terms of available payments options. With relaxed anti-money laundering laws that double as deterrents against tax-evasion and privacy, merchants are encouraged to adopt new technologies with premise of ever-increasing consumer footfall, without much regard for fraudulent behaviours and technology administration overheads.

On the flipside, the intense focus on innovation and competition can leave interoperability and coexistence neglected. QR Codes from competing companies can use incompatible data encoding standards, and different payment networks to process the payments. The difference in data and technology standards can lead to many closed-loop payment ecosystems within a market. Like other network-based systems, payments observe the network effect: the more participants in the network, the more valuable the network is to participants. A history of network systems indicates that as the market matures, the standards converge and the number of players consolidates into a few (but larger) ecosystems that manage to achieve a critical mass of participants ensuring sustainability.

The China use-case described in this paper (refer to pages 21 and 22) provides an example of the network effect in the evolution of QR Payments. Alipay and WeChat are currently the two dominant closed-loop payment ecosystems in the Chinse market. The image below indicates a typical site at merchant checkout in China where a customer is presented with variety of QR Payment options.

Figure 21: Customers in China have a variety of QR Payment options



(Source: Forrester Research)

In a market where the regulatory body takes a hands-off approach, we can expect to see the proliferation of competitors keen to push their approach as a de-facto industry standard. The number of closed-loop payment networks would emerge competing for the share of the market. Eventually, through competition, the market would be concentrated in a few large players that have managed to establish a critical mass.

Table 1 summaries the possible market implications expected in a largely unregulated market for QR Payments. Overall, considering different dimensions describing the scenario, the progress towards financial inclusion and a cashless society is considered to be of a relatively low speed.

Table 1: An overview of a QR Code unregulated payments market

Dimension	Scenario	Possible implications
Innovation	High	Low market entry costs coupled by high rewards lead to high number of new market entrants.
Interoperability	Low	High competition with low regulatory oversight has competitors racing to develop value-add services and lock customers in their own ecosystems.
Market collaboration	Low	High competition for the market share prohibits collaboration.
Industry costs	High	Whereas innovation drives down the transaction costs absorbed by consumers and merchants, the overall industry costs are high due to number of different players duplicating efforts to develop competing services.
Market risks	High	Low financial literacy coupled with intense competition within deregulated market can introduce money laundering and fraud related risks.
Speed towards financial inclusion/cashless society	Low	Open market competition encourages many entrants providing choice of innovative services. However, the lack of collaborative efforts and perceived fraud risks can present barriers to replacing the hard earned cash with electronic payments.

Scenario 2: A regulated market

In countries such as China and Thailand, which have achieved higher financial inclusion and faster adoption rates of QR Payments, local governing bodies have begun implementing stricter regulations with the objective to help safeguard consumers and provide a more level playing field to all players. One of the key regulatory measures applied is to standardise QR Payments.

Standardisation of QR Payments has the potential to expand network reach and avoid market fragmentation by enabling interoperability of credit transfer services. Standardisation could push players to adopt an open-loop model, thus benefiting the consumers through increased safety, convenience and a seamless payment experience.

Where security is concerned, regulations play a significant part in countering fraud and money laundering as well as protecting transaction security and data privacy. In this regard, regulations do little to impact the seamless customer experience. More importantly, it safeguards consumers' interest by imposing payment limits (static for lower thresholds and dynamic codes for higher transactions) and additional KYC for transactions of larger amounts. It also facilitates the free flow of transaction data to the regulators that will enable better fraud detection and improve effectiveness of counter money laundering activities. If executed well, enhanced security stemming from a regulated market has the potential to instil consumer confidence in utilising QR Payments, especially during the initial phase, before any players have established a strong position in the market.

Another aspect that regulations hope to address is the unfair practices within the QR Payments environment. The intense competition for market share typically sees players providing subsidies to consumers at unsustainable levels. This risk is potentially even more detrimental when applied in the FinTech industry given the exposures to the central bank. Enforcing floor and ceiling prices will ensure minimal market distortions and level playing field for players. Although this approach will not be favourable for merchants, in the long term, it ensures sustainability and credibility to the QR Payments industry.

Despite improvements in security and convenience brought about through increased governance, it can also stagnate market innovation. The sudden clampdown on technical and operating requirements – such as service availability, data security, product quality, network management, safety assessment, regulatory reporting, to list the few – can significantly increase business operating costs and inadvertently create a barrier to entry for new FinTechs. In addition, the increase of business operating costs for the existing service providers risks a trickledown effect of costs being passed on to consumers and merchants through higher transaction fees. The drive to compete on price, rather than innovation, will benefit larger and more established players who are able to absorb the higher operational costs.

Increased security, interoperability and convenience are some of the key benefits consumers and merchants can observe in a more regulated market. Overall there is also an improved confidence and trust in legitimately of service providers. However, on the down side, there is the potential to stifle innovation and deter new market entrants.

Table 2 summaries the possible market implications expected in a tightly regulated market by a central governance body. Overall, considering different dimensions describing the scenario, the progress towards financial inclusion and cashless society is considered to have, relatively, moderate speed.

Table 2: An overview of a regulated market

Dimension	Scenario	Possible implications
Innovation	Low	Higher operating costs mandated by regulations drive service providers to focus on compliance first, and innovation second.
Interoperability	High	Regulatory driven, data encoding and transition standardised, payment network democratised.
Market collaboration	Medium	Collaboration as a by-product of regulatory-driven common policy compliance. Directive to comply without collaborative approach to define and implement policies can result with tension between market players.
Industry costs	High	Though fewer number of players in the market, the overall cost-to-serve is still high in order to meet the stringent regulatory requirements.
Market risks	Low	Tight regulations with curbed competition lower the money laundering and fraud related risks.
Speed towards financial inclusion/ cashless society	Medium	Higher cost-to-serve might result with higher transaction fees for consumers and merchants. Lower number of service providers could leave rural and remote areas without adequate innovation focus and service coverage.

Scenario 3: The Golden Middle – A moderated market

To create a scenario which employs the level of regulation that is just right for a particular market, one needs to understand the various objectives of each participant in the market. One of the key objectives for a regulatory body is to promote financial inclusion and increase the overall level of wealth and economic growth, while fostering a safe and transparent marketplace.

Financial regulatory authorities and financial service providers share the common goal to democratise financial services for the population. For a regulator, higher financial inclusion improves the transparency and oversight of the market. For the service providers, it increases their addressable market size, and for consumers and merchants, the extended reach and improved richness of financial services brings convenient and cost-effective solutions.

With this perspective in mind, there are two main considerations to address:

1. How can the financial system provide consumers and merchants with more value, convenience and confidence to drive the adoption of cashless payments and to progress financial inclusion?

2. How can the financial system improve interoperability, transparency and security while promoting infrastructure development that fosters innovation and keeps market entry barriers low?

To effectively address these two considerations within the context of a specific market – in our case Indonesia – we propose the expansion of the existing QR Payments Taskforce to include FinTechs with prominent QR Payment solutions already in the market. The taskforce presently facilitates working sessions between Bank Indonesia together with select members of ASPI.

Moreover, on an ad-hoc basis, depending on the particular market segment and industry topics being considered, merchant and consumer representatives should also be invited to join discussion on the QR Payments. The premise of the working group is simple: the more collaborative, holistic and transparent discourse we can have, the more informed decisions we can make. For example, in a moderately regulated market – the Golden Middle – aiming to balance between market innovation, interoperability and safety could focus on encouraging the use of, and compliance with, the established payment infrastructure and data exchange standards to process the payments. To further increase interoperability an Open Banking agenda could be promoted. Open Banking regulation enlists the ownership of consumers' data to consumers themselves. This requires financial service providers to act not as owners of consumer data but rather as data custodians. As such, financial service providers are required to expose customer data to third parties via a standardised set of APIs, should a customer request for it. PSD2 in Europe is an example of the Open Banking standard currently in place.[68]

Concurrently, market innovation could be promoted through the competition for a differentiating experience and value-add. By innovating at the edges of engagement touchpoints with consumers and merchants, the market would be free to introduce novel, low-cost, frictionless payment services.

The encouraged use of the existing payment network infrastructure by non-traditional payment players would allow for lower overall transaction costs with improved traceability and the overall safety of the financial system. Combined with the 'licence' to innovate, the market would continue to propel payments innovation and user engagement. Ultimately, helping Indonesia move closer towards becoming a cashless society and improving financial inclusion.

Table 3 summaries the possible market implications expected in a moderately regulated market. Regulation is focused on the proliferation and use of shared payment networks, data exchange and security standards. Simultaneously, the market is encouraged to innovate at the edges of user interfaces and touchpoints: payment data capture, encoding and presentation. Overall, considering different dimensions describing the scenario, the progress towards financial inclusion and a cashless society will be of a higher speed.

Table 3: An overview of a moderated market

Dimension	Scenario	Possible implications
Innovation	High	Lower operating costs through reuse of existing payment networks help lower the market entry barriers and encourage new players with innovative solutions to emerge. Innovation focused on differentiated user experiences and value-add.
Interoperability	High	Payment providers are free to develop open/closed-loop ecosystem based on the choice of data encoding standard at the point of data capture. Regulatory driven, data transition protocols are standardised, payment network is democratised and equally available to established payment providers as it is to new entrants who choose to leverage it. Open Banking standards promote consumer data sharing between different service providers.
Market collaboration	High	Collaboration proactively facilitated through setup of industry wide payment council. Shared regulatory commitments and governance drive collaboration.
Industry costs	Moderate	Optimised use of existing payment infrastructure across the market helps manage the costs. FinTechs encouraged to compete for user engagement focusing innovation budgets on solving consumers and merchant pain points.
Market risks	Moderate	Regulations focused on visibility and control of payment networks lower money laundering and fraud related risks. Low to moderate risks persist within closed-looped ecosystems that bypass the shared payment infrastructure.
Speed towards financial inclusion/ cashless society	High	Shared payment infrastructure encourages new market entrants to innovate and keeps the cost-to-serve low. Improved collaboration between market players and encouraged interoperability through use of existing payment networks propels the cashless payments.

Scenario comparisons

In summary, our analysis indicates that for an accelerated pace towards achieving a cashless society and promoting financial inclusion, Indonesia would do well to adopt a balanced approach between governance, control, collaboration and innovation. The right balance between different dimensions would have to be iteratively developed, monitored and adjusted to meet the unique needs of the Indonesian market (Table 4).

Table 4: Summary of the scenarios comparing different levels of the market regulation

			An ideal scenario
Scenario	**Unregulated**	**Tightly regulated**	**Moderately regulated**
User interaction Payment processing Dimension	• Unregulated • Unregulated	• Regulated • Regulated	• Unregulated • Regulated
Innovation	●	○	●
Interoperability	○	●	●
Market collaboration	○	◑	●
Industry costs	○	○	●
Market risks	○	●	◑
Speed towards financial inclusion and cashless society	Slower	Moderate	**Faster**

Relatively better ● <----------> ○ Relatively poorer

Conclusion

Achieving economic progress and bolstering financial inclusion are shared responsibilities of all stakeholders in the financial system.

In our report, we showed that the use of QR Codes is a relatively simple, inexpensive and secure way to help process transactions across parties in a payment model. The case studies highlighted indicate how the QR Code's simplicity and flexibility can promote innovation in the payments sector. The innovative cashless payment solutions generate electronic trails and payment transparency and it is these electronic payment logs that both consumers and merchants need to access credit from banks, enabling sustainable economic growth.

The same can be extrapolated for the Indonesian market. The more successful the financial services market is at fostering innovation to increase the reach and richness of services delivered digitally, the more Indonesians will be able to benefit from it.

The Indonesian market currently presents unique challenges with its comparatively high unbanked population, low smartphone penetration and fragmented geographical landscape. Simply following QR Payment methods and standards adopted in other markets might not necessarily work in Indonesia. An alternative would be to take an experimental and incremental approach to piloting payment methods and standards in order to find the right balance that works for the Indonesian market. In the scenarios section of the paper, we explored three contrasting approaches to QR Payments in the market, balancing between the speed of innovation and degree of regulation. Based on the scenarios, we infer that Indonesia's accelerated push towards the ubiquitous adoption of cashless payments and greater financial inclusion will be best served through:

1. **Highly collaborative and iterative industry-wide approach to evolve QR Payment infrastructure and standards specific to the market needs.**
   Collaboration effectiveness is maximised through inclusive and continuous discourse bringing together representatives from regulatory bodies, banks, card-payment providers, FinTech consumer bodies and merchant associations. While Bank Indonesia is already facilitating discussions on QR Payments with ASPI, there is an opportunity to follow the examples set by China, Singapore and Thailand for closer collaboration with the technology innovation community – the FinTechs that already serve the most users and have the most experience in QR Payments – as well as consumer and merchant representation, where relevant.

2. **Focus the initial iterations of QR Payment regulations and standards on the development, usage and governance of shared infrastructure for the payment processing, data exchange, operating model and security.**
   This will allow for a greater interoperability between existing payment providers and lower entry barriers for new challengers with innovative solutions.

3. **Allow for the interpretation of QR Code data encoding capabilities at user touchpoints.**
   Interpretation of QR Code will promote appropriation of QR capabilities for the development of improved and novel payment solutions, to drive user engagement and ultimately foster market innovation.

It will be essential for the Indonesian payments community to continuously collaborate to scale interoperability across different payment providers and increase the adoption by consumers and merchants. This will help accelerate progress towards achieving a cashless society and promoting financial inclusion. The objective of collaboration is to find the right balance between innovation, control and transparency across the payment ecosystem. Market control and transparency indicate safety and confidence in the financial system. These are factors of trust that are as important to service adoption and usefulness as are the frictionless and personalised user experience.

With this paper, our intent is to inspire future, in-depth studies that will explore considerations, trade-offs and approaches for iterative and collaborative design and implementation of the most effective roadmaps for QR Payments, balancing between innovation and regulation, for Indonesian market.

The near future is poised to bring more innovative digital services, distribution channels, currencies and identity tokens. These will continue to bring us closer to achieving a cashless Indonesia, promote financial inclusion, and accelerate economic growth, benefiting all parties in the system. Taking the collaborative and holistic approach to accelerate democratisation of the financial services for all Indonesians is a joint responsibility of both the public and private sectors.

Appendix

Table 5: Payment systems in Indonesia[69]

	System	Transactions processed	Operator	Members
Settlement and clearing systems	**Bank Indonesia Real Time Gross Settlement (BI-RTGS) System**	• High value interbank electronic funds transfers • Settlement: interbank money market, customer transfers, government transactions and monetary management • Funds settlement for Bank Indonesia Certificates and Government Securities traded on the BI-Scripless Securities Settlement System (BI-SSSS)	Bank Indonesia	• All banks in Indonesia, including sharia divisions (143 banks) • One switching company
	Bank Indonesia Clearing System	• Debit funds transfers by means of electronically processed cheques, bilyet giro, debit notes • Credit funds transfers processed electronically for small payments	Bank Indonesia	All banks in Indonesia (143 banks including all branch offices numbering about 2,100)
	Central Depository and Book Entry Settlement System (C-BEST)	Funds settlement for securities transactions on the capital market	Indonesian Central Depository (PT KSEI)	All stock exchange members, funds settlement conducted through 4 settlement banks where stock exchange members maintain settlement accounts
ATM, debit and credit cards	**Shared ATM Network – National Brands**	Electronic funds transfers by means of ATM cards	PT Artajasa Pembayaran Elektronis (ATM Bersama)	67 banks are members of the ATM-Bersama network, interbank settlement processed through the BI-RTGS system
			LINK	Four state banks, interbank settlement processed through the BI-RTGS system
			PT Rintis Sejahtera (PRIMA)	• ATM and Debit Prima network settlement processed through member accounts at BCA • Membership totals 25 banks
			PT Daya Network Lestari (ALTO)	15 banks are members of the ALTO network, settlement processed through member accounts at one member bank
			Cakra	Three banks are members of the Cakra network, settlement processed through member accounts at one member bank

	System	Transactions processed	Operator	Members
ATM, debit and credit cards	**Intrabank ATM Networks**	Electronic funds transfers using ATM cards for book entry account transfers at the same bank	70 banks provide this facility	-
	Shared ATM Network – International Brands	Electronic funds transfers using ATM cards for book entry account transfers at the same bank	MasterCard International (Cirrus)	Nine banks are Cirrus members, settlement processed through member accounts at one member bank
			Visa International (Plus)	10 banks are Plus members, settlement processed through member accounts at one member bank
			Others	-
	Debit Card Networks – National brands	Electronic transfer at Point of Sale (POS)	BCA (Debit BCA)	16 banks are members of Debit BCA
			Kartuku	Two banks are members, settlement processed through member accounts at one member bank
	Debit Card Networks – International brands	Electronic transfer at Point of Sale (POS)	Visa International (Visa Electron)	10 banks are members, settlement processed through member accounts at one member bank
			MasterCard International (Maestro)	Nine banks are members, settlement processed through member accounts at one member bank
	Credit Card Networks	Electronic payment by credit card	Visa International	15 banks are members, settlement processed through member accounts at one member bank
			MasterCard International	13 banks and 1 non-bank financial institution are members, settlement processed through member accounts at one member bank
			JCB	Two banks are members, settlement processed through member accounts at one member bank
			Diners Club	One member (Diners)

	System	Transactions processed	Operator	Members
Money transfers	**Funds transfers/ remittances – Domestic networks**		PT Pos Indonesia (postal money orders)	_
			Courier companies providing cash delivery services	_
			Other companies specialising in remittance services	_
			Money changers offering remittance services	_
			Shops and travel agents also offering remittance services	_
			Others	_
	Funds transfers/ remittances – International networks	Funds transfers/remittances with receipt in cash or beneficiary account - international payments only	Western Union	One bank, PT Pos Indonesia and non-bank companies operating as agents for Western Union
			Money Gram	Some banks and non-bank companies, such as shops and travel agents, operating as agents for Money Gram
			Others	_

1.History of QR Code. Denso Wave. http://www.qrcode.com/en/history/

2.The History of QR Codes Standardization. Denso Wave. http://www.qrcode.com/en/about/standards.html

3.When It Makes Sense To Pay Using Cash Or Credit. Forbes. https://www.forbes.com/sites/learnvest/2017/09/29/when-it-makes-sense-to-pay-using-cash-or-credit/2/#79efa38b47a8

4.Advantages and Disadvantages of Different Payment Types. Nxgen. https://us.nxgen.com/advantages-and-disadvantages-of-different-payment-types/

5.Understanding the Cost of Handing Cash in Asia Pacific. The Asian Banker Research. http://retailbanking.theasianbanker.com/assets/media/dl/whitepaper/UnderstandingthecostofhandlingcashinAsiaPacific.pdf

6.Four Party Model. Visa. https://www.visaeurope.com/about-us/four-party-model/

7.The Ins and Outs of Push Payments. Comdata.

8.An Examination of the Economics of Payment Card Systems. Swiss National Bank. https://www.snb.ch/en/mmr/reference/zahlungskarten/source/Zahlungskarten.en.pdf

9.Credit Card Education. HSBC. https://www.hsbc.com.my/1/2/personal-banking/credit-cards/credit-card-education/know-about-credit/pro-and-con-of-using-credit

10.When It Makes Sense To Pay Using Cash Or Credit. Forbes. https://www.forbes.com/sites/learnvest/2017/09/29/when-it-makes-sense-to-pay-using-cash-or-credit/2/#79efa38b47a8

11.Credit Card Education. HSBC. https://www.hsbc.com.my/1/2/personal-banking/credit-cards/credit-card-education/know-about-credit/pro-and-con-of-using-credit

12.When It Makes Sense To Pay Using Cash Or Credit. Forbes. https://www.forbes.com/sites/learnvest/2017/09/29/when-it-makes-sense-to-pay-using-cash-or-credit/2/#79efa38b47a8

13.FAQ: Chip-Enabled Card Acceptance (EMV). Chase. https://www.chasepaymentech.com/faq_emv_chip_card_technology.html

14.The Nilson Report Issue 1096 October 2016. https://nilsonreport.com/upload/content_promo/The_Nilson_Report_10-17-2016.pdf

15.Advantages and Disadvantages of Different Payment Types. Nxgen. https://us.nxgen.com/advantages-and-disadvantages-of-different-payment-types/

16.Mobile payment using NFC. Wirecard. https://www.wirecard.com/products/mobile-payment/payment-with-mobile/nfc/

17.Ibid

18.Promoting Competition in Mobile Payments: The Role of USSD. CGAP. http://documents.worldbank.org/curated/en/586781468127790413/pdf/952010BRI0Box30ole0of0USSD0Feb02015.pdf

19.Ibid

20.Mitigating Security Risks in USSD Based Mobile Payment Applications. Aujas. https://blog.aujas.com/2011/05/31/mitigating-security-risks-in-ussd-based-mobile-payment-applications/

21.EMV Technologies. https://www.emvco.com/emv-technologies/qrcodes/

22.Wounded QR Codes. Data Genetics. http://datagenetics.com/blog/november12013/index.html

23.Payment System in Indonesia https://www.bi.go.id/en/sistem-pembayaran/di-indonesia/perkembangan/Contents/Default.aspx

24.The Jakarta Post, Bank Indonesia launches national payment gateway, http://www.thejakartapost.com/news/2017/12/04/bank-indonesia-launches-national-payment-gateway.html

25.The Little Data Book on Financial Inclusion 2018: Indonesia. https://globalfindex.worldbank.org/sites/globalfindex/files/countrybook/Indonesia.pdf

26.Fintech lending opens up opportunities for SMEs. The Jakarta Post, 18 January 2017. http://www.thejakartapost.com/academia/2017/01/18/fintech-lending-opens-up-opportunities-for-smes.html

27.Indonesia's fintech lending boom exploits shortfall in bank loans. Reuters, 30 January 2018. https://www.reuters.com/article/us-indonesia-fintech/indonesias-fintech-lending-boom-exploits-shortfall-in-bank-loans-idUSKBN1FJ0F4

28.Smartphone penetration rate as share of the population in Indonesia from 2015 to 2022. Statista. https://www.statista.com/statistics/321485/smartphone-user-penetration-in-indonesia/

29.Indonesia midrange smartphone segment expands even as overall market remains flat YoY, IDC reports. IDC, 16 August 2017. https://www.idc.com/getdoc.jsp?containerId=prAP42999517

30. Countries in the Asia Pacific region ranked by the number of mobile subscribers in 2015 (in millions). Statista. https://www.statista.com/statistics/376688/unique-mobile-subscribers-asia-pacific-by-country/

31.Indonesia's new cyber agency looks to recruit staff of hundreds. Reuters. 5 January 2018. https://www.reuters.com/article/us-indonesia-cyber/indonesias-new-cyber-agency-looks-to-recruit-staff-of-hundreds-idUSKBN1EU15X

32.New credit card scrutiny sends Indonesians back to cash. Reuters. 30 May 2016. https://www.reuters.com/article/us-indonesia-tax/new-credit-card-scrutiny-sends-indonesians-back-to-cash-idUSKCN0YK0TK

33.The Little Data Book on Financial Inclusion 2018: Indonesia. https://globalfindex.worldbank.org/sites/globalfindex/files/countrybook/Indonesia.pdf

34.Statistical Report on Internet Development in China. China Internet Network Information Center (CNNIC), January 2017. https://cnnic.com.cn/IDR/ReportDownloads/201706/P020170608523740585924.pdf

35.Ibid

36.In urban China, cash is rapidly becoming obsolete. New York Times, 16 July 2017. https://www.nytimes.com/2017/07/16/business/china-cash-smartphone-payments.html

37.The mobile payments race: Why China is leading the pack- for now. Wharton, University of Pennsylvania, 17 January 2018. http://knowledge.wharton.upenn.edu/article/how-will-chinas-overseas-mobile-payment-systems-fare

38.China tightens regulation over mobile payment apps - What's next for Tencent and Ant Financial? Forbes, 3 January 2018. https://www.forbes.com/sites/ywang/2018/01/03/china-tightens-regulation-over-mobile-payment-apps-whats-next-for-tencent-and-ant-financial/#151f17ee7f1d

39.Gov't to legalize popular QR code payment services. Chinanews.com, 15 August 2016. http://www.ecns.cn/siness/2016/08-15/222531.shtml

40. Ibid

41.Rules set for bar code, QR code payment. ChinaDaily.com, 29 December 2017. http://usa.chinadaily.com.cn/a/201712/29/WS5a458b89a31008cf16da4193.html

42.ePassi-Alipay – a new and efficient way to grow sales. ePassi. https://www.epassi.fi/en/epassi-alipay-mobile-payment

43.FAQ/Merchants. ePassi. https://www.epassi.fi/en/faq-merchants

44.About Prahan Mantri Jan Dhan Yojana. https://pmjdy.gov.in/

45.The Little Book of Financial Inclusion 2018: India. https://globalfindex.worldbank.org/sites/globalfindex/files/countrybook/India.pdf

46.All UPI apps have to support BharatQR: NPCI. The Economic Times. 20 March 2018. https://economictimes.indiatimes.com/small-biz/startups/newsbuzz/all-upi-apps-will-have-to-support-bharat-qr-ncpi/articleshow/63375142.cms

47.What is BharatQR and How Does it Power Digital Transactions? Razorpay. https://razorpay.com/blog/what-is-bharatqr-code-and-how-does-it-power-digital-transactions

48.Merger of MyClear and MEPS – Strengthening Malaysia's Payments Infrastructure to Accelerate Migration to E-Payments. Bank Negara Malaysia, 22 May 2017. http://www.bnm.gov.my/index.php?ch=en_press&pg=en_press&ac=4440&lang=en

49.BNM Thinks That Malaysia's Future Is QR Codes, Despite Many Challenges. Vulca Post, 3 July 2018. https://vulcanpost.com/634838/bnm-qr-code-malaysia-ictf-payment/

50.9 Digital Payments in Malaysia That You Need To Know About. CompareHero.com, 14 December 2017. https://www.comparehero.my/blog/digital-payments-malaysia

51. Seven payment companies collaborate to boost QR Payments in Singapore. WireCard, 25 January 2018. https://www.wirecard.com/newsroom/press-releases/newsdetail/seven-payment-companies-collaborate-to-offer-qr-payments-in-singapore/

52.Payments Council Sets Up Taskforce to Develop Common QR Code for Singapore. Monetary Authority of Singapore, 29 August 2017. http://www.mas.gov.sg/News-and-Publications/Media-Releases/2017/Payments-Council-Sets-Up-Taskforce-to-Develop-Common-QR-Code-for-Singapore.aspx

53.2017 Year in Review: Going cashless no small change. The Straits Times. 25 December 2017. https://www.straitstimes.com/tech/going-cashless-no-small-change

54.Payments Council endorses Singapore Quick Response Code specifications for electronic payments. Monetary Authority of Singapore, 20 November 2017. http://www.mas.gov.sg/News-and-Publications/Media-Releases/2017/Payments-Council-endorses-Singapore-Quick-Response-Code-Specifications-for-electronic-payments.aspx

55.Smartphone penetration rate as share of the population in Singapore from 2015 to 2022. Statista, Technology & Telecommunications, Telecommunications. 2018. https://www.statista.com/statistics/625441/smartphone-user-penetration-in-singapore/

56.90% of Singaporeans prefer cash payments: PayPal. TODAY Online. 29 August 2017. https://www.todayonline.com/singapore/90-singaporeans-prefer-cash-payments-paypal

57.PayNow to be linked to Thailand's PromptPay, among slew of initiatives announced at Fintech Festival. The Straits Times, 14 November 2017. http://www.straitstimes.com/business/banking/paynow-to-be-linked-to-thailands-promptpay-among-slew-of-initiatives-announced-at

58.Collaboration on Adopting Standardized QR Code for e-Payment. Bank of Thailand, 2017. https://www.bot.or.th/Thai/PressandSpeeches/Press/News2560/n4160e.pdf

59.Ibid

60.Banks get green light for QR code payment service. The Nation, 14 November 2017. http://www.nationmultimedia.com/detail/Corporate/30331529

61.The state of FinTech in Indonesia UOB, https://www.uobgroup.com/techecosystem/pdf/UOB-State-of-FinTech-in-ASEAN.pdf

62.The state of FinTech in Indonesia (Infographic). 29 January 2018. TechInAsia. https://www.techinasia.com/state-of-indo-fintech

63.Bank Indonesia

64.Go-Jek's Go-Pay rolls out QR code-based payment services. E27, 17 May 2018. https://e27.co/GO-JEKs-GO-PAY-rolls-out-qr-code-based-payment-services-20180517

65.Go-Jek Acquires Three Companies to Dominate Payment in Indonesia. Bloomberg, 15 December 2017. https://www.bloomberg.com/news/articles/2017-12-15/go-jek-acquires-three-companies-to-dominate-payment-in-indonesia

66.QR Code's Implementation for Payment and Its Regulations in Indonesia. Daily Social ID, 28 December 2017. https://dailysocial.id/post/qr-codes-implementation-for-payment-and-its-regulations-in-indonesia

67.Anggota ASPI. https://www.aspi-indonesia.or.id/anggota-aspi

68.How to flourish in an uncertain future: Open banking and PSD2. Deloitte UK. 2017. https://www2.deloitte.com/content/dam/Deloitte/cz/Documents/financial-services/cz-open-banking-and-psd2.pdf

69. Payment system development in Indonesia. Bank Indonesia. https://www.bi.go.id/en/sistem-pembayaran/di-indonesia/perkembangan/Contents/Default.aspx

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