QR Code Merchant Payments

A growth opportunity for mobile money providers

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Contents

INCLUSIVE
TECH LAB

Executive summary

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Mobile money providers (MMPs) are key players in the provision of financial services in emerging markets. MMPs now see QR code merchant payments as a potential adjacent opportunity to expand their products and services and target potential incremental revenue streams.

Globally, digital payments are expected to reach an annual transaction value of USD 4.4 trillion in 2020, with 17 per cent CAGR through 2024.* With growth rates like this, it is not surprising that merchant payments have captured the interest of many stakeholders, including MMPs.

QR code payments are enjoying significant but fragmented global growth, often competing with long-established payment methods, such as card payments. There are a number of QR code schemes around the world, but none more successful than the two primary Chinese players, Alipay and WeChat Pay.

In 2019, 640 million Alipay customers regularly transacted in two or more Alibaba Group ecosystem product/service categories. Another 190 million regularly transact in five or more categories.
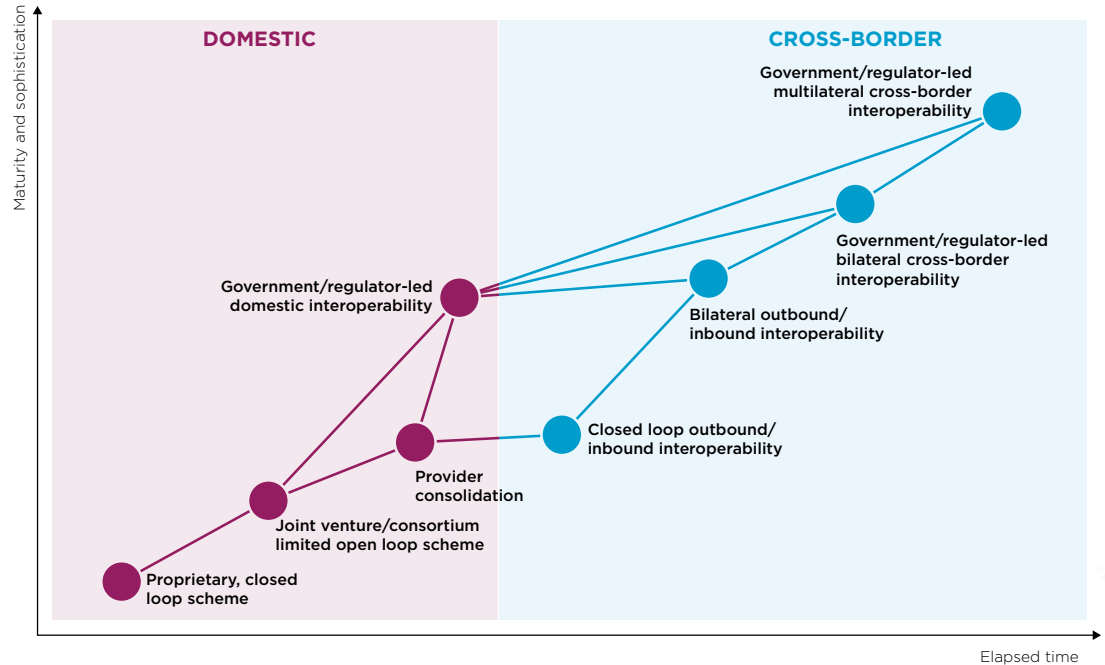
While this report does not advocate a "copycat" approach of the Chinese market and its players, we can learn much from events in China and many other schemes around the world, whether newly emerging, rapidly growing or somewhere in between.

Legend: **Digital commerce** **Mobile POS payments**

Executive summary
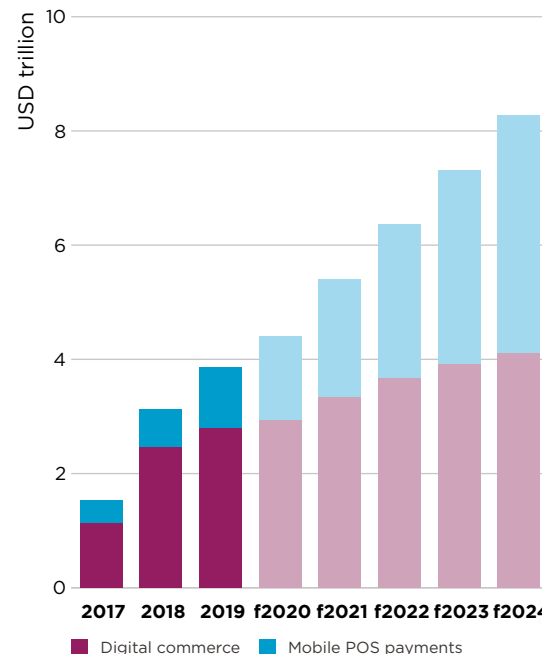
To facilitate this, the report provides an insight into a wide range of QR code deployments and specifications globally – including the Chinese giants (Alipay, WeChat Pay) of course, but also other QR code specifications like EMV, JPQR, Bharat QR, HKQR, SGQR, QRIS, Prompt Pay, Mercado Pago and Pix, among others.

QR code merchant payments present a significant, but potentially complex opportunity for MMPs, and the challenges and strategic benefits must be considered carefully.
In particular, interoperability is a crucial requirement for the industry to achieve a harmonised customer experience for QR code merchant payments, driving customer adoption, transaction volumes and overall profitability.

The interoperability journey

Maturity and sophistication

DOMESTIC

CROSS-BORDER

Government/regulator-led multilateral cross-border interoperability

Government/regulator-led bilateral cross-border interoperability

Government/regulator-led domestic interoperability

Bilateral outbound/ inbound interoperability

Provider consolidation

Closed loop outbound/ inbound interoperability

Joint venture/consortium limited open loop scheme

Proprietary, closed loop scheme

Elapsed time

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Executive summary

Key lessons

- MMPs with large and active **USSD** customer bases will need to carefully consider the best course of action to avoid excluding these customers from the QR code payments journey, while also recognising and addressing practical challenges, such as device affordability and connectivity.

- Having a **core ecosystem of products and services** that continues to drive high levels of customer engagement is crucial. (Payments should support these ecosystems; they are not the ecosystem).

- QR code merchant payments have several key **enablers and interdependencies**, most of which must be addressed to increase chances of success. For example: device affordability, internet connectivity, wallet/bank account penetration and merchant distribution.

- **Market dynamics and nuances** are important. While developing markets in Asia tend to have high smartphone and internet penetration, developing markets in Africa tend to have low smartphone and internet penetration. These call for fundamentally different approaches.

- **Regulatory approaches and interventions** differ between geographies, for example, African and Chinese regulators have played a limited role until now (although this is changing), while Southeast Asian and Indian regulators have played an extremely active role in QR schemes from the outset.

- On its own, a QR code merchant payments P&L is unlikely to be compelling. Rather, value will be derived from data. However, QR codes have the potential to significantly **accelerate digitisation of economic activity** in emerging markets, paving the way for additional tailored services to be provided to customers, leading to further revenue streams.

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Rationale for this report

- QR codes are an increasingly ubiquitous payment channel around the world.

- In emerging markets, mobile money providers are at the forefront of using QR codes, but face several challenges.

- This report is intended as a resource for mobile money providers that wish to adopt and/or grow their QR code merchant payments ecosystems.

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QR codes are an increasingly ubiquitous payment channel around the world

In 2018, Chinese consumer and business mobile payment volumes reached USD 41 trillion,* about 30 per cent ($13 trillion) of which were QR code payments, primarily through Alipay (founded in 2004) and WeChat Pay (founded in 2011).

Other countries, such as Denmark, India, South Korea and Sweden, also have high mobile payments adoption rates, with the US, Canada, Norway and Japan not far behind.

Global mobile payments adoption is expected to grow by about 27 per cent (CAGR, 2020–2025).**

As a subset of mobile payments, consumer digital payments volumes are expected to top $4.4 trillion in 2020.*** The top five countries account for almost 75 per cent of the total, but all of Africa contributes just 1.8 per cent of the total.

* All values are in US dollars
** This includes mobile-based NFC payments
*** Statista, 2020 (adjusting for expected effects of COVID-19)

The rapid growth of mobile and digital payments around the world offers mobile money providers (MMPs) an opportunity to expand their mobile money ecosystems to provide mobile payment services to consumers and merchants.

Currently, the mobile payments market is being served by MMPs, fintechs, smartphone providers, e-commerce providers and banks. Within mobile payments, QR code merchant payments are growing rapidly across Asia, Africa and Latin America.

QR code merchant payments offer a significant opportunity for MMPs, but they are not without challenges.

**Consumer digital payments
Top five countries, volumes (f2020)**

Country	%	Volume
China	44%	1,921
United States	20%	896
Japan	4%	165
United Kingdom	4%	164
South Korea	2%	114
Rest of World	26%	1,147

US$ billions

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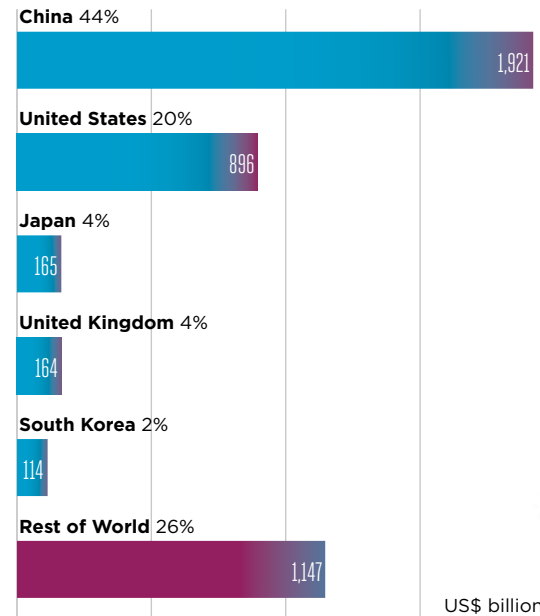
In developing markets mobile money providers are at the forefront of using QR codes, but face several challenges

Developing markets, such as those on the African continent and Indian sub-continent, have for a long time been exploring the mobile money opportunity from different perspectives, typically to support basic use cases, such as mobile top-ups or person-to-person remittances.

Many of these initiatives have been successful despite many barriers. In these markets, adoption has been limited by, for example:

- **high unbanked populations;**
- **fragmented and unreliable mobile internet connectivity; and**
- **lack of affordable devices.**

Some markets, such as India, have managed to overcome many of these challenges, typically with concerted and sustained government-led initiatives. For example, India now has enviably high levels of bank account penetration across the entire population.

MMPs in developing markets are seeking to expand their mobile money ecosystems into merchant payments by building on core strengths established through their mobile money initiatives.

While QR code merchant payments are considered an attractive opportunity, many existing challenges remain and some new challenges have emerged. For example:

- Deep penetration of **feature phones that rely upon USSD** transaction dialogues and do not support scanning of QR codes;

- Many **divergent views and specifications** that have been developed globally as part of the core QR code ecosystem design.

With concentration around two key players, China is relatively unique. This is seldom the case in other territories, and **competition will therefore be aggressive**, but consolidation will likely result in only the most successful surviving,

especially as few users will tolerate having many wallets.

The approach that MMPs take to understanding and addressing these and other issues will define the nature and degree of their success in the QR code merchant payments ecosystem.

This report is intended as a resource for mobile money providers that wish to adopt and/or grow their QR code merchant payments ecosystems

Since MMPs will be at different stages in their QR code merchant payments journeys, this report is intentionally broad to support MMPs regardless of their current focus, whether it be basic QR code merchant payments acceptance, more sophisticated ecosystem interoperability or stages in between.

The objective of this report is to examine the opportunities and challenges of QR code merchant payments by:

- sharing insights on the QR code merchant payments ecosystem and various initiatives around the world;

- describing QR code merchant payments in the context of a journey to help MMPs identify where they are in their respective journey;

- highlighting key lessons that can be elicited from various initiatives around the world;

- sharing insights and perspectives on some of the fundamental technical considerations of QR code merchant payments, and

- sharing insights and perspectives on the impacts and implications of some of the major trends in QR code merchant payments.

All the above will be synthesised into a proposed call to action for MMPs as they move forward with their respective QR code initiatives.

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The rise of QR codes in payments

- Originally a tool for tracking automobile machine parts, the rise of QR codes in payments was enabled by the widespread adoption of digital wallets.

- Uptake has been high in China, and their relatively inexpensive form factor and ease of use has helped make QR codes popular in other parts of the world.

- Today, prominent QR code merchant payments deployments are evident around the globe.

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Originally a tool for tracking automobile machine parts, the rise of QR codes in payments was enabled by the widespread adoption of digital wallets

Types of QR codes

Model 2 | **Micro QR** | **iQR code** | **SQRC** | **FrameQR**

Invented by Denso Wave in Japan in 1994, the use of Quick Response (QR) code has grown in popularity from its origins in the automotive manufacturing industry through to today's merchant payments ecosystems.

Origins and history of QR codes

A QR code is similar to a bar code except it can store a larger amount of information per unit area. It is a two-dimensional code that is capable of 360-degree (omni-directional) high-speed reading.

Initially used in the automotive industry for production, tracking and shipping, QR codes expanded beyond the automotive industry into identification and marketing use cases and finally payments.

China has played a crucial role in the rapid growth of QR code mobile payment services, enabling businesses to accept digital payments without investing in any hardware, such as point of sale (POS) terminals.

The evolution of QR code payments

One of the core enablers of QR code payments has been the mobile wallet. Principally, mobile wallets can operate as:

- **A link to a primary value store**, such as a customer card/bank account. Transactions debit the value from the primary account via the wallet. No preloading of the wallet is required.

- **A virtual store of value**, such as digital/virtual/mobile money that is preloaded into the wallet. Transactions debit the value from the wallet balance.

Note: some wallets offer both models

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Relatively inexpensive and easy to use, QR code payments are becoming popular in other parts of the world

QR code merchant payments

In merchant payments, QR codes have been used to replace or complement traditional POS devices and interact almost seamlessly with compatible ecosystem mobile wallets.

The form factor and presentation of a QR code differ depending on the merchant/transaction context, but the following are the primary dimensions to consider:

- **QR code model:** Model 2 is available on a free-to-use licence from Denso. It has sufficient data payload capabilities to effectively support payments transactions, and is therefore the most common form factor in QR code payments currently. Other models of QR codes are available from Denso, but are typically subject to a licence fee and often require specialised scanners.

- **Static QR codes:** Typically printed stickers found at merchant check-out locations or displayed on customer device screens. They hold specific data elements and do not change.

- **Dynamic QR codes:** Dynamically generated at the time of the transaction and require a merchant or customer screen to display. They are typically valid for a short period and contain several contextually unique data elements.

- **Merchant-presented mode (MPM):** The MPM transaction journey requires a customer to scan the merchant's static or dynamic QR code to initiate a transaction.

- **Customer-presented mode (CPM):** The CPM transaction journey requires the merchant to scan the customer's static or dynamic QR code to initiate a payment transaction.

Person-to-person (P2P) payments

QR codes can be used for P2P payments.

Biometric payments

Fingerprint and facial biometrics are enjoying a great deal of attention in payments and could ultimately replace QR code payments in certain circumstances. The scenario considered here extends beyond using a biometric to authenticate/authorise a card or QR code transaction.

For example, the facial recognition biometric becomes the payment token and, apart from the merchant's biometric scanner, no device (e.g. smartphone), card or QR code are required. Please see Appendix A for further insights.

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Not just a Chinese phenomenon

There is significant focus on QR code merchant payments around the world, across developing and developed markets alike.

Adoption remains fragmented and, in some markets, typically Europe, the UK and North America, incumbent card-based merchant payments continue to dominate.

The primary drivers of adoption vary between markets, but with most developing markets focused on reducing the use of cash, improving financial inclusion and providing a relatively low-cost, non-cash merchant payments option.

Around the world, initiatives tend to be either proprietary or government/regulator-led, and each market has unique opportunities and challenges.

MMPs in Africa continue to explore QR code merchant payments in addition to their existing mobile money offerings.

In mature Asian markets, such as China, Japan, Korea and Taiwan, regulators have ultimately taken the lead in pursuing domestic interoperability and, in some cases, cross-border interoperability.

Developing Asian markets, such as Indonesia, Thailand and other Southeast Asian countries, are also heavily regulator-led, with some seeking to avoid card payments entirely.

India's high levels of bank account penetration have enabled the regulator to pursue an ambitious, multi-faceted merchant payments strategy with QR codes and card payments operating side by side.

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Today, QR code deployments are evident around the globe – some prominent regional examples

Asia and Middle East

$1,920.5bn | **16.4%** | **902M**
CHINA
Alipay
WeChat Pay

$16.4bn | **10.7%** | **5.2M**
HONG KONG
Standard: Faster
Payment System
Wechat Pay HK
Alipay HK

$113.5bn | **14.9%** | **37M**
SOUTH KOREA
Standard: ZeroPay
KakaoPay
NaverPay

$165.2bn | **16.0%** | **88M**
JAPAN
Standard: JPQR
Paypay
LinePay
RakutenPay
dPayment

$6.0bn | **19.2%** | **72M**
PAKISTAN
Easypaisa
JazzCash
Kenuu Wallet

$2.19bn | **9.0%** | **11M**
TAIWAN
Standard: TaiwanPay
JKOPAY
LinePay*

$15.4bn | **24.2%** | **21M**
SAUDI ARABIA
STC Pay
Halalah
BayanPay

$10.0bn | **19.0%** | **39M**
PHILIPPINES
PayMaya
G Cash

$69.3bn | **24.2%** | **590M**
INDIA
Standard: Bharat QR
PayTM
MobiKwik

$11.8bn | **6.5%** | **13M**
MALAYSIA
National: DuitNow
Boost
Touch 'n Go
GrabPay**
RazerPay

$9.0bn | **16.0%** | **88M**
THAILAND
Standard: PromptPay/ThaiQR
TrueMoney
LinePay**

$8.1bn | **19.6%** | **36M**
VIETNAM
Momo
ZaloPay
ViettelPay
VNPay
GrabPay**

$34.6bn | **16.5%** | **130M**
INDONESIA
Standard: QRIS
GoPay
OVO
Linkaja
T-Cash

$14.6bn | **12.4%** | **3.1M**
SINGAPORE
Standard: SGQR
NETSPay
GrabPay

Map labels:
CHINA $1,921bn
INDIA $69bn
JAPAN $165bn
KOREA $114bn

Legend:
- Expected total annual digital payments* transaction value in USD (f2020)
- Expected total annual digital payments transaction growth rate (CAGR, 2020–2024)
- Number of digital payments users (f2020)

Transaction value for digital payments (f2020)
- $1,001bn–$2,000bn
- $101bn–$1,000bn
- $50bn–$100bn
- <$50bn

* The digital payments market segment is led by consumer transactions and includes payments for products and services which are made over the internet as well as mobile payments at point-of-sale (POS) via smartphone applications. Includes: Online processed payment transactions, mobile POS payments processed via smart devices at point of sale, digital consumer commerce transactions (e.g. credit card, online payment providers, etc.). Does not include mPOS solutions (dongle payments) for card payments or mobile card readers, business-to-business payments, electronic banking (eBanking), provision fees from payment providers.

** Providers where headquarters located in other country

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Today, QR code deployments are evident around the globe – some prominent regional examples

Africa

MOROCCO
inwi money
$2.8bn | 16.0% | 12M

GHANA
mVisa**
MTN*
Airtel*
$2.2bn | 32.1% | 6.6M

NIGERIA
mVisa**
MTN*
$9.3bn | 17.9% | 65M

DEMOCRATIC REPUBLIC OF CONGO
M-Pesa**

BOTSWANA
Ecocash**
$0.5bn | 34.5% | 0.7M

SOUTH AFRICA
MasterPass**
MTN MoMo
SnapScan
Zapper
$8.1bn | 23.7% | 26M

EGYPT
mVisa**
Masterpass**
$8.1bn | 25.6% | 41M

UGANDA
MTN**
$1.2bn | 34.3% | 7.6M

KENYA
mVisa**
M-Pesa
$2.9bn | 31.0% | 16M

RWANDA
mVisa**
M-Pesa
$0.7bn | 38.2% | 2.5M

TANZANIA
M-Pesa**
Tigo Pesa
Airtel Money
$1.1bn | 31.8% | 6.6M

ZAMBIA
FNB
$1.5bn | 36.9% | 3.6M

ZIMBABWE
Ecocash
$1.3bn | 36.9% | 3.6M

Expected total annual digital payments* transaction value in USD (f2020)

Expected total annual digital payments transaction growth rate (CAGR, 2020–2024)

Number of digital payments users (f2020)

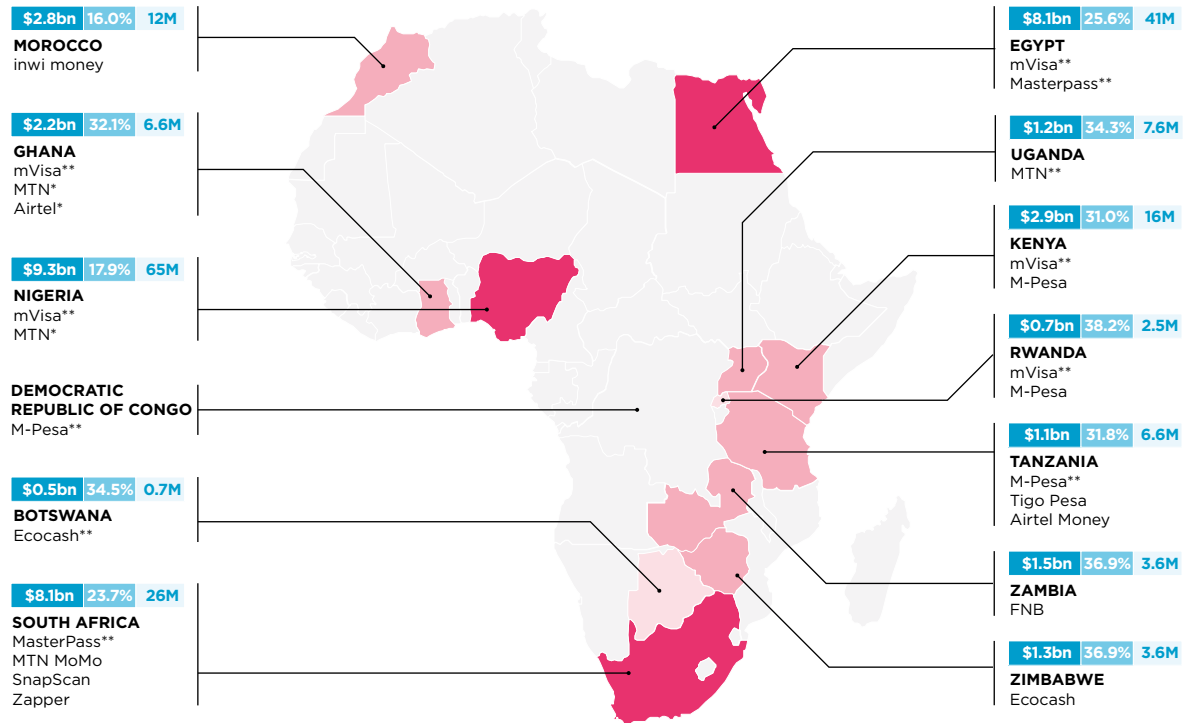**Transaction value for digital payments (f2020)**

$8.1bn–$10.0bn

$4.1bn–$8.0bn

$1.0bn–$4.0bn

<$1.0bn

* The digital payments market segment is led by consumer transactions and includes payments for products and services which are made over the internet as well as mobile payments at point-of-sale (POS) via smartphone applications. Includes: Online processed payment transactions, mobile POS payments processed via smart devices at point of sale, digital consumer commerce transactions (e.g. credit card, online payment providers, etc.). Does not include mPOS solutions (dongle payments) for card payments or mobile card readers, business-to-business payments, electronic banking (eBanking), provision fees from payment providers.

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Latin America

MEXICO
$32.0bn | 18.8% | 51M
Mercado Pago**
CoDi

MEXICO
$32.0bn

COLOMBIA
$8.2bn | 12.6% | 22M
Mercado Pago**

CHILE
$8.5bn | 19.8% | 11M
Mercado Pago**

VENEZUELA
Mercado Pago**

BRAZIL
$51.4bn | 33.2% | 105M
Standard: PIX***
Mercado Pago**

BRAZIL
$51.4bn

URUGUAY
$1.9bn | 52.4% | 1.3m
Mercado Pago**
VALEpie**
Todo Pago**
Ualá*

ARGENTINA
$15.4bn | 28.7% | 25M
Mercado Pago
VALEpie
Todo Pago
Ualá

Expected total annual digital payments* transaction value in USD (f2020)

Expected total annual digital payments transaction growth rate (CAGR, 2020–2024)

Number of digital payments users (f2020)

Transaction value for digital payments (f2020)

$41bn–$52bn

$21bn–$40bn

$10bn–$20bn

<$10bn

* The digital payments market segment is led by consumer transactions and includes payments for products and services which are made over the internet as well as mobile payments at point-of-sale (POS) via smartphone applications. Includes: Online processed payment transactions, mobile POS payments processed via smart devices at point of sale, digital consumer commerce transactions (e.g. credit card, online payment providers, etc.). Does not include mPOS solutions (dongle payments) for card payments or mobile card readers, business-to-business payments, electronic banking (eBanking), provision fees from payment providers.

** Providers where headquarters located in other country

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Three primary QR code merchant payments flows

- From a product flow perspective, a QR code payment solution can be understood as a combination of nine interdependent elements.

- Each element has several options under it to choose from.

- Three broad product flows are possible for QR code merchant payment solutions depending on how elements are grouped and the transaction characteristics.

- Each product flow results in a distinct experience for the payer and payee of a QR code solution.

From a product flow perspective, a QR code payment solution can be understood as a combination of nine interdependent elements

Communication channel
The network and communication channel the customer/merchant device uses

Transaction channel
In-store/face-to-face or remote

Device
Smartphone, smart feature phone, feature phone

Transaction authentication
Method the customer uses to authenticate for the transaction (PIN/password/biometric)

QR code presentation
Whether the QR code is presented by the merchant or the customer

Customer connectivity
Is the customer connected to the communication channel or not (typically the internet)

Payment type
Push payments are typically initiated by the customer, pull payments are are initiated by the merchant

Merchant connectivity
Is the merchant connected to the communication channel or not (typically the internet)

QR code type
Static or dynamically generated QR code

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Each element is underpinned by several interdependent options

QR codes harness several key, interdependent elements to support successful, wide-reaching merchant payments. The adjacent diagram illustrates the top-down dependencies, with communication channels and device capabilities being the most fundamental elements to unlock the various modalities of QR code merchant payments.
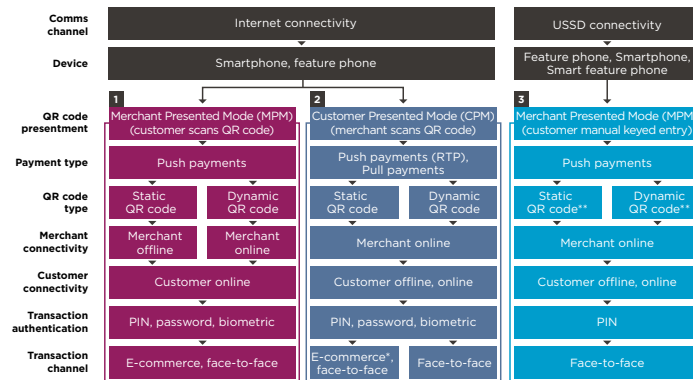
For example, USSD connectivity will take users along a route of manual data capture that typically excludes QR codes from this type of transaction.

Conversely, a smartphone coupled with internet connectivity enables both customer-scanned (i.e. merchant-presented mode) and merchant-scanned (i.e. customer-presented mode) QR code transactions. Additional options then appear depending on whether a static or dynamically generated QR code is used in the transaction.

QR code merchant payments require these key elements to work together as seamlessly as possible. The extent to which this is achieved will have a fundamental impact on factors such as:

- the customer and merchant payment types accepted;

- the customer and merchant payment acceptance rates;

- the channels in which customers can transact; and

- the overall merchant/customer transaction experience.

The following sections will delve into how these components work together to create various types of QR code merchant payment transaction flows and capabilities.

|	Merchant Presented Mode (MPM) (customer scans QR code)		Customer Presented Mode (CPM) (merchant scans QR code)		Merchant Presented Mode (MPM) (customer manual keyed entry)	
Comms channel	Internet connectivity				USSD connectivity	
Device	Smartphone, feature phone				Feature phone, Smartphone, Smart feature phone	
QR code presentment	**1**		**2**		**3**	
Payment type	Push payments		Push payments (RTP), Pull payments		Push payments	
QR code type	Static QR code	Dynamic QR code	Static QR code	Dynamic QR code	Static QR code**	Dynamic QR code**
Merchant connectivity	Merchant offline	Merchant online	Merchant online		Merchant online	
Customer connectivity	Customer online		Customer offline, online		Customer offline, online	
Transaction authentication	PIN, password, biometric		PIN, password, biometric		PIN	
Transaction channel	E-commerce, face-to-face		E-commerce*, face-to-face	Face-to-face	Face-to-face	

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Three broad product flows are possible for QR code merchant payment solutions depending on how elements are grouped and the transaction characteristics

There are three primary interaction options between customers and merchants that have enabled QR code payments:

- Merchant-presented mode (MPM)

- Customer-presented mode (CPM)

- Merchant-presented USSD

These three product flows are illustrated below in the context of their interdependencies. The following pages will summarise the key entities and steps during an in-store purchase transaction.
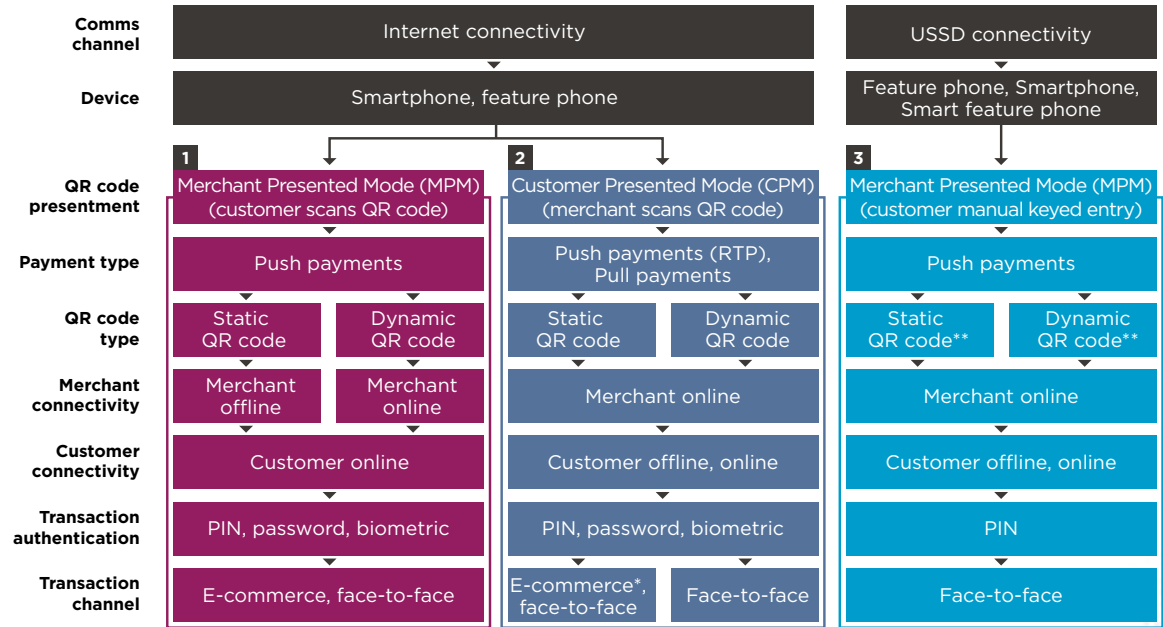
* Only possible when customer is online

** Merchant identifier must be visible in human readable format, to be keyed in by customer

*** Refer to Appendix A for a description of each element

	1 Internet connectivity		**3** USSD connectivity
Comms channel	Internet connectivity		USSD connectivity
Device	Smartphone, feature phone		Feature phone, Smartphone, Smart feature phone
QR code presentment	Merchant Presented Mode (MPM) (customer scans QR code)	Customer Presented Mode (CPM) (merchant scans QR code)	Merchant Presented Mode (MPM) (customer manual keyed entry)
Payment type	Push payments	Push payments (RTP), Pull payments	Push payments
QR code type	Static QR code / Dynamic QR code	Static QR code / Dynamic QR code	Static QR code** / Dynamic QR code**
Merchant connectivity	Merchant offline / Merchant online	Merchant online	Merchant online
Customer connectivity	Customer online	Customer offline, online	Customer offline, online
Transaction authentication	PIN, password, biometric	PIN, password, biometric	PIN
Transaction channel	E-commerce, face-to-face	E-commerce*, face-to-face / Face-to-face	Face-to-face

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1 Each product flow results in a distinct experience for the payer and payee of a QR code solution: Merchant-presented QR code payment

QR code payment transaction type:
- Merchant Presented (MPM)
- Static or Dynamic QR code
- Push payment

MPM with a static QR code sticker is a typical implementation for micro-merchants where no/low payment acceptance costs are critical. These merchants are typically transitioning from cash-only acceptance.

MPM with dynamic QR codes is more typical of larger, more sophisticated merchants where they have the POS capability to generate and display a dynamically generated QR code
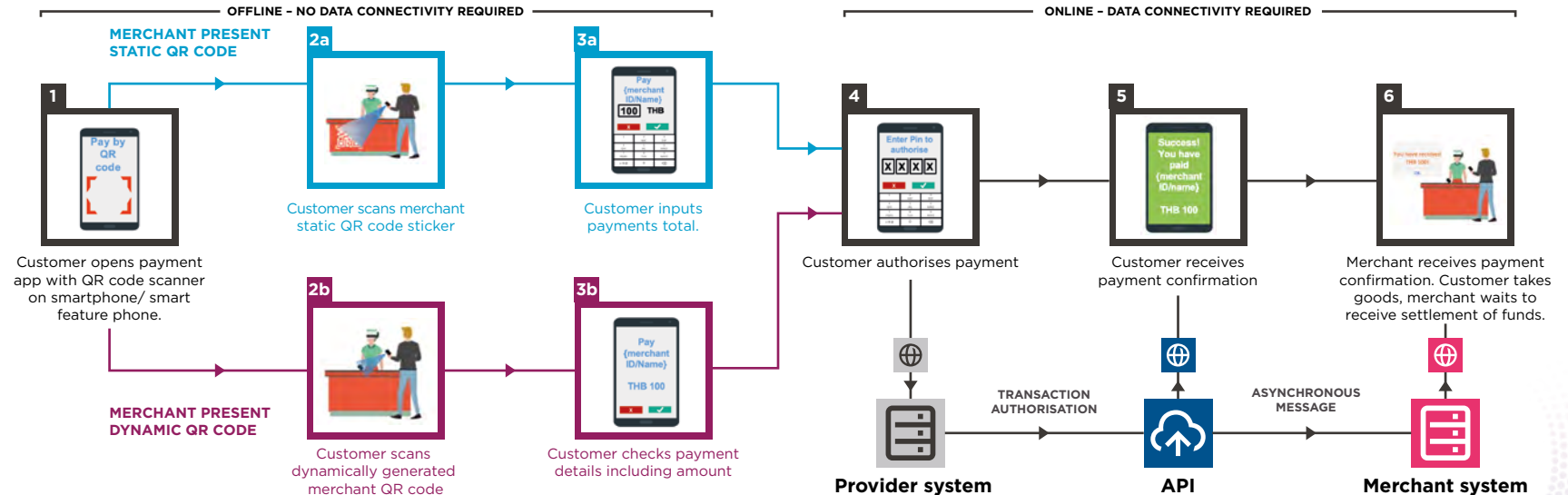
Applies to:

Smartphone

Smart feature phone

OFFLINE – NO DATA CONNECTIVITY REQUIRED

ONLINE – DATA CONNECTIVITY REQUIRED

MERCHANT PRESENT STATIC QR CODE

1
Pay by QR code

Customer opens payment app with QR code scanner on smartphone/ smart feature phone.

2a

Customer scans merchant static QR code sticker

3a
Pay {merchant ID/Name} 100 THB

Customer inputs payments total.

MERCHANT PRESENT DYNAMIC QR CODE

2b

Customer scans dynamically generated merchant QR code

3b
Pay {merchant ID/Name} THB 100

Customer checks payment details including amount

4
Enter Pin to authorise

Customer authorises payment

5
Success! You have paid {merchant ID/Name} THB 100

Customer receives payment confirmation

6
You have received THB 100!

Merchant receives payment confirmation. Customer takes goods, merchant waits to receive settlement of funds.

Provider system

TRANSACTION AUTHORISATION

API

ASYNCHRONOUS MESSAGE

Merchant system

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Each product flow results in a distinct experience for the payer and payee of a QR code solution: Customer-presented QR code payment

2

QR code payment transaction type:
- Customer Presented (CPM)
- Static or Dynamic QR code
- Push (RTP) or Pull payment

CPM with a static or dynamic customer QR code (on a smartphone or feature phone screen) relies on merchants having the capability to scan these QR codes at checkout.

CPM can either initiate a push or pull payment. In the case of a pull payment the merchant will seek authorisation against customer funds. In the case of a push, the merchant will send a Request To Pay (RTP) to the customer. The customer will then authorise this payment by initiating a push payment directly from a bank/wallet account.

Applies to:

Smartphone   Smart feature phone

OFFLINE – NO DATA CONNECTIVITY REQUIRED

ONLINE – DATA CONNECTIVITY REQUIRED

CUSTOMER PRESENT PULL PAYMENT METHOD

4a Merchant scans QR. decodes data, sends to POI system and authorisation system

1 Merchant scans goods and enters transaction details on system

2 Customer opens payment app with QR code payment on smartphone / smart feature phone

3 Customer app displays QR code (static) or generates a one-time QR code (dynamic). Merchant scans customer's QR code.

Merchant scans QR, decodes data, sends to POI system and wraps data payload into a Request to Pay (RTP) message

Customer sent payment details to authorise and then receives payment confirmation

6 Merchant receives payment confirmation. Customer takes goods, merchant waits to receive settlement of funds.

4b

5b

CUSTOMER PRESENT PUSH PAYMENT METHOD

Merchant system

Provider system

API

TRANSACTION AUTHORISATION

ASYNCHRONOUS MESSAGE

Merchant system

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3 Each product flow results in a distinct experience for the payer and payee of a QR code solution: Merchant-presented QR code payment (USSD)

QR code payment transaction type:

- Merchant Presented (MPM)
- Static or Dynamic QR code*
- USSD payment

In this scenario, the customer uses a feature phone that cannot scan QR codes and is therefore required to manually key the number printed adjacent to the merchant's QR code sticker (e.g. Merchant ID) to initiate a USSD dialogue to complete the transaction.
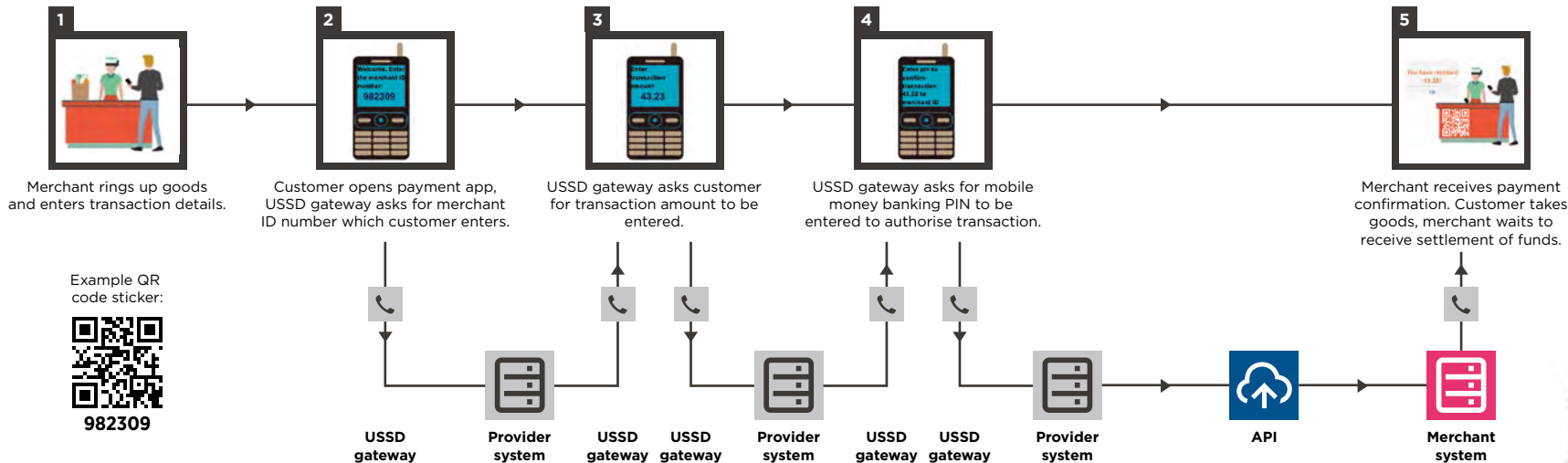
This is not strictly a QR code payment transaction as the QR code is not scanned. This type of transaction exists solely to enable feature phone payments within QR code payments schemes, i.e. backwards compatibility in feature phone dominated markets.

Applies to:
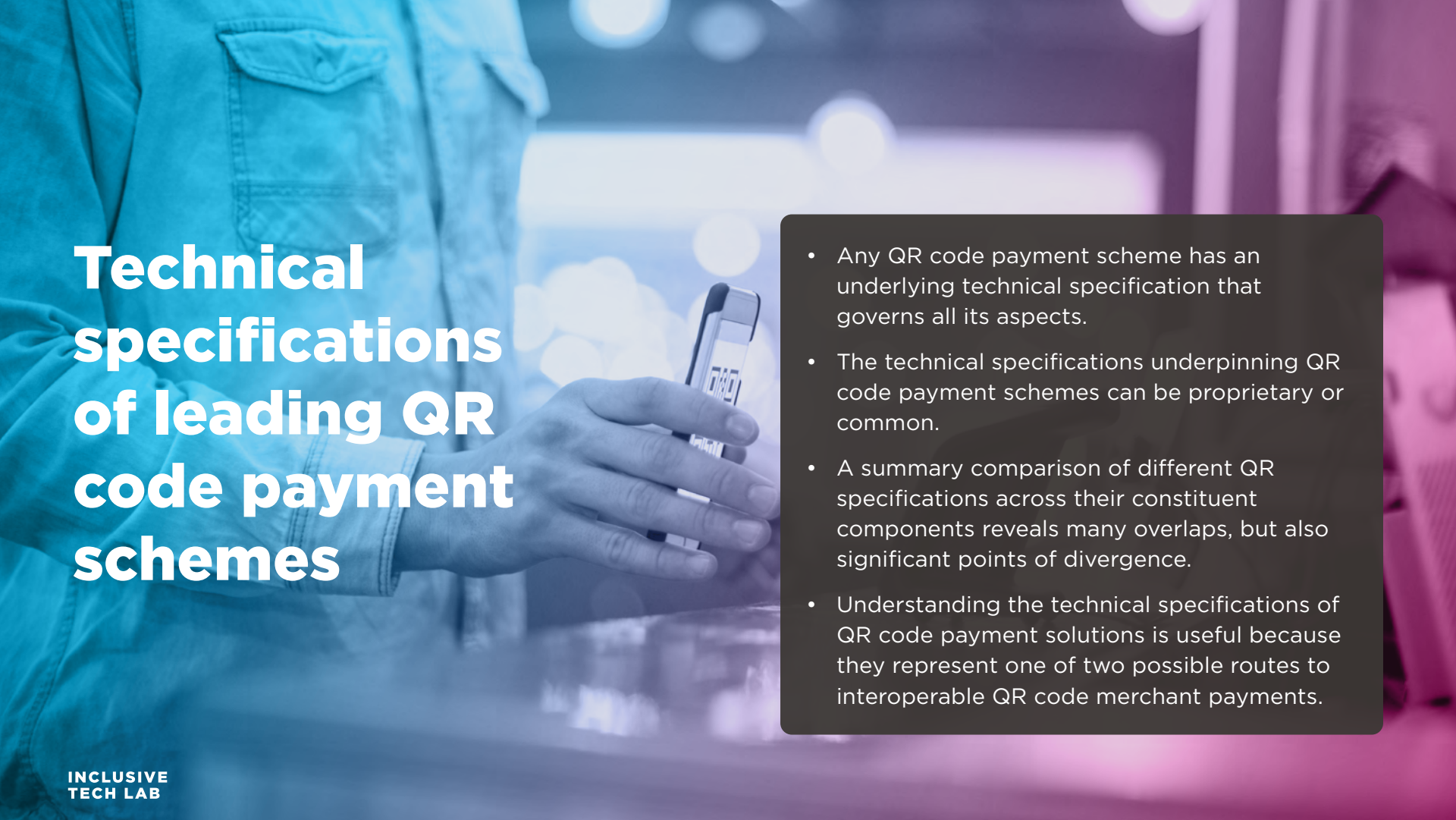
Feature phone**

OFFLINE – NO DATA CONNECTIVITY REQUIRED. PAYMENT THROUGH USSD CHANNEL

1 Merchant rings up goods and enters transaction details.

2 Customer opens payment app, USSD gateway asks for merchant ID number which customer enters.

3 USSD gateway asks customer for transaction amount to be entered.

4 USSD gateway asks for mobile money banking PIN to be entered to authorise transaction.

5 Merchant receives payment confirmation. Customer takes goods, merchant waits to receive settlement of funds.

Example QR code sticker:

982309

USSD gateway | Provider system | USSD gateway | USSD gateway | Provider system | USSD gateway | USSD gateway | Provider system | API | Merchant system

* Irrespective of whether a static or dynamic code is presented, a unique, human readable number is required to uniquely identify the merchant transaction. This number is typically the Merchant ID and is manually keyed into the feature phone by the customer to initiate a USSD dialogue.

** Technically possible on smartphones and smart feature phones, but unlikely to be provisioned as such apart from as an atypical fallback option.

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Technical specifications of leading QR code payment schemes

- Any QR code payment scheme has an underlying technical specification that governs all its aspects.

- The technical specifications underpinning QR code payment schemes can be proprietary or common.

- A summary comparison of different QR specifications across their constituent components reveals many overlaps, but also significant points of divergence.

- Understanding the technical specifications of QR code payment solutions is useful because they represent one of two possible routes to interoperable QR code merchant payments.

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Any QR code payment scheme has an underlying technical specification that governs all its aspects

In addition to the payments components covered under product flow (see the diagram below), the technical specifications of a QR code solution also encompass:

- Authentication approach: various customer and merchant authentication approaches, from PINs and passwords to biometrics
- Data payload scope: the scope of data elements embedded within the QR code

Communication channel
The network and communication channel the customer/merchant device uses

Transaction channel
In-store/face-to-face or remote

Device
Smartphone, smart feature phone, feature phone

Transaction authentication
Method the customer uses to authenticate for the transaction (PIN/password/biometric)

QR code presentation
Whether the QR code is presented by the merchant or the customer

Customer connectivity
Is the customer connected to the communication channel or not (typically the internet)

Payment type
Push payments are typically initiated by the customer, pull payments are are initiated by the merchant

Merchant connectivity
Is the merchant connected to the communication channel or not (typically the internet)

QR code type
Static or dynamically generated QR code

The technical specifications underpinning the design of QR code payment schemes can be proprietary or harmonised

At the highest level, when designing a QR code payments scheme, providers can elect to adopt a proprietary approach or a more open, harmonised design approach.

The matrix below shows examples of major QR code ecosystem players that have chosen to develop and implement **proprietary specifications**, along with the QR code presentment modalities they support.

Proprietary specifications approach		
Example schemes	**MPM**	**CPM**
Alipay	Supported	Supported
WeChat Pay	Supported	Supported
MTN	Supported	Not supported
M-Pesa	Supported	Not supported
Mercado Pago	Supported	Not supported
Kakao Pay	Supported	Supported

Examples of major QR code ecosystem players that have chosen to develop and implement a more **harmonised approach**, some using EMVCo's EMV specification for QR code payments:

Harmonised specifications approach		
Example schemes	**MPM**	**CPM**
EMV QR code specs	Supported	Supported
Hong Kong Common QR Code (HKQR) (Hong Kong Interbank Clearing Limited)	Supported	Not supported
SGQR (Monetary Authority of Singapore)	Supported	Supported
JPQR (Payments Japan)	Supported	Supported
Bharat QR (National Payments Corporation of India (NPCI))	Supported	Supported
Thai QR Payment/MyPromptQR	Supported	Supported
Quick Response Code Indonesian Standard (QRIS)	Supported	Supported

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A summary comparison of QR specifications across their constituent components reveals many overlaps, but also significant points of divergence

Summary: Core QR code payments components can be summarised across the example schemes as follows:

	Specification	Comms channel	Device	QR code presentment	QR code type	Txn channel
Harmonised specifications	EMV	Internet connectivity	Smartphone	MPM, CPM	Dynamic, static	Face-to-face
	JPQR		Smartphone	MPM, CPM	Dynamic, static	Face-to-face
	Bharat QR		Smartphone, feature phone	MPM	Dynamic, static	Face-to-face
	HKQR		Smartphone	MPM	Dynamic, static	Face-to-face
	SGQR		Smartphone	MPM, CPM	Dynamic, static	Face-to-face
	QRIS		Smartphone	MPM	Static	Face-to-face
Proprietary specifications	Alipay		Smartphone	MPM, CPM	Dynamic, static	Face-to-face, remote
	WeChat Pay		Smartphone	MPM, CPM	Dynamic, static	Face-to-face, remote
	Prompt Pay		Smartphone	MPM	Dynamic, static	Face-to-face
	M-Pesa	USSD connectivity	Smartphone, feature phone	MPM	Static	Face-to-face, remote
	Mercado Pago	Internet connectivity	Smartphone	MPM, CPM	Dynamic, static	Face-to-face, remote

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A summary comparison of QR specifications across their constituent components reveals many overlaps, but also significant points of divergence

Summary: Authentication and **authorisation** approaches across the example schemes are as follows:

	Specification	Authentication approach	When*	Detail
Harmonised specifications	EMV	No mandatory requirements	—	EMVCo has not provided any mandatory requirements for authentication.
	JPQR	No mandatory requirements	—	JPQR does not specify any mandatory requirements, so the authentiation varies by company. JPQR recommends PIN, fingerprint or facial recognition
	Bharat QR	Username and password	2) The app is launched	When a customer launches the app, they approve it with a username and password. There is no other form of approval and the customer cannot choose.
	HKQR	Password or biometrics	1) The mobile device is unlocked	*If the bill exceeds 1,000 yuan (~$150), the user will have to enter his password in the complete transaction.
	SGQR	No mandatory requirements	—	SGQR has not provided any mandatory requirements for authentication.
	QRIS	No mandatory requirements x	—	QRIS has not provided any mandatory requirements for authentication.
Proprietary specifications	Alipay	Password and biometrics	3) Before payment	The most common payment authentication methods have been passwords and fingerprints. Some devices support facial recognition that the user can choose.
	WeChat Pay	Password and biometrics	3) Before payment	WeChat Pay requires the user to enter their payment password to confirm the transaction.
	Prompt Pay	Passwords	3) Before payment	Some companies let users use Face ID and fingerprints as an authentication method, but the common authentication method is typing passwords before settlement.
	M-Pesa	Passwords	3) Before payment	The authentication method is typing a PIN before settlements. The user can change the PIN on the M-Pesa app at any time.
	Mercado Pago	No mandatory requirements	—	Mercado Pago does not specify any mandatory requirements before or after settlement.

* Authentication is performed at 1) when the mobile device is unlocked, 2) when the app is launched, or 3) at the time of payment.

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A summary comparison of QR specifications across their constituent components reveals many overlaps, but also significant points of divergence

Summary: Analysis of the scope and coverage of the QR code data payload across the example specifications:

	Specification	QR code data		
		Data for Merchant Presented Mode	**Data for Customer Presented Mode**	**Data for linking up with different schemes***
Harmonised specifications	EMV	Defined in the specification	Defined in the specification	Not defined in the specification
	JPQR			
	Bharat QR		Not defined in the specification	
	HKQR			Defined in the specification
	SGQR	No published QR code data information		
	QRIS			
Proprietary specifications	Alipay			
	WeChat Pay			
	Prompt Pay	Defined in the specification	Not defined in the specification	Not defined in the specification
	M-Pesa			
	Mercado Pago			

* For a more detailed comparative analysis of different QR code technical specifications, refer to Appendix E.
** Columns of data are provided to work with each scheme, such as a "Reserve for EMVCo"

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A summary comparison of QR specifications across their constituent components reveals many overlaps, but also significant points of divergence

Summary: Analysis of the scope and coverage of the QR code data payload across the example specifications:

Specification	QR code data		
	Data for Merchant Presented Mode	Data for Customer Presented Mode	Data for linking up with different schemes*
Harmonised specifications	Understanding the technical specifications of QR code solutions is useful as they represent one of two possible routes to interoperable QR code merchant payments.		
Proprietary specifications			

* For a more detailed comparative analysis of different QR code technical specifications, refer to Appendix E.
** Columns of data are provided to work with each scheme, such as a "Reserve for EMVCo"

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Charting a course for interoperable QR code merchant payments

- There appears to be a clear path for most QR code merchant payment schemes around the world.

- As QR code merchant payments schemes evolve, two primary dimensions of interoperability are typically encountered: domestic and cross-border.

- There are two primary approaches to QR code merchant payments interoperability: harmonisation of QR code specifications and harmonisation via API and/or back-end integration.

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There appears to be a clear path for most QR code merchant payment schemes around the world

There are many QR code payments initiatives around the world, many of which are in different stages of development and maturity. Regardless of the stage, there appears to be a clear path for most QR code payment schemes, with an important focus on interoperability:

- Almost all schemes start with a domestic agenda.

- Initiatives evolve differently and follow different paths, but there is a clear progression from domestic to cross-border interoperability over time (see adjacent diagram).

- In many cases, initiatives will not only follow different paths, but also appear to double back as priorities change.

DOMESTIC

CROSS-BORDER

Maturity and sophistication

Government/regulator-led
multilateral cross-border
interoperability

Government/regulator-led
bilateral cross-border
interoperability

Bilateral outbound/
inbound interoperability

Government/regulator-led
domestic interoperability

Closed loop outbound/
inbound interoperability

Provider
consolidation

Joint venture/consortium
limited open loop scheme

Proprietary, closed
loop scheme

Elapsed time

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There appears to be a clear path for most QR code merchant payment schemes around the world

Examples of some primary drivers that could influence the path to interoperability are:

Business case priorities, e.g. domestic payments agenda at the outset, with some changing to a cross-border agenda over time.

Scaling, e.g. seeking options to scale the capability of existing QR code payments via partnership(s), e.g. joint venture/ consortium, etc.

Market efficiencies, e.g. seeking options to consolidate offerings within domestic markets, across or even outside regions.

Government/regulatory intervention (domestic), e.g. Government or regulator taking an early lead to establish national QR code payments schemes, or becoming involved later to bring about market harmonisation. Government/regulator involvement tends to focus initially on a domestic agenda primarily due to obligations to the national population.

Government/regulatory cross-border support, e.g. where a significant proportion of the population will be well served by a joined-up approach to payments in territories where there is a mutual government-to-government interest, such as a major outbound tourist destination.

Progress towards interoperability is seldom linear and encompasses various dimensions. These will be examined in the following sections.

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As QR code payments schemes evolve, two key dimensions of interoperability are typically encountered: domestic and cross-border interoperability

The diagram alongside illustrates the key dimensions of interoperability and how they lead to different outcomes based on the strategic ambitions and objectives of a scheme.

Geographic focus	Domestic interoperability			Cross-border interoperability	
Directionality	One way vs Dual interoperability			Inbound vs Outbound interoperability	
Agreement structures	Bilaterals	Multilaterals	National initiatives/ National scheme	National vs Proprietary scheme interoperability	
				Proprietary scheme to National scheme	National scheme to Proprietary scheme
Integration approach	Harmonised QR code				
	Back-end API				

Viewpoint

The different dimensions of **domestic interoperability**
• One-way vs dual interoperability
i. One-way interoperability (e.g. Scheme A customers can transact with Scheme B merhants)
ii. Dual interoperability (e.g. Scheme A customers and Scheme B customers can transact with Scheme A and B merchants)
• Agreement structures
i. Bilaterals (i.e. proprietary scheme to proprietary scheme)
ii. Multi-lateral agreements (i.e. JVs/consortium appraoch between multiple proprietary schemes)
iii. National initiatives (i.e. National scheme)

The different dimensions of **cross-border interoperability**
• Inbound vs outbound interoperability between proprietary schemes
i. Inbound: e.g. Scheme A (e.g. in Japan) enables Scheme B's customers (e.g. from China) to transact with it in Japan
ii. Outbound: e.g. Scheme D (e.g. in China) enables its customers to transact with Scheme E merchants (e.g. in Indonesia)
• National scheme interoperability vs proprietary scheme interoperability
i. Inbound and/or outbound interoperability is enabled via interoperability between National Scheme J (e.g. in Japan) and proprietary Scheme C (e.g. from China)
ii. Inbound and/or outbound interoperability is enabled via interoperability between National Scheme P (e.g. in Indonesia) and National Scheme Q (In Thailand)

Two primary **integration approaches to interoperability**
1. Harmonised QR code specifications (i.e. interoperability enabled via front-end harmonisation)
2. Integrated APIs with differing/proprietary QR code specifications (i.e. interoperability enabled via back-end integration, typically APIs)

As QR code payments schemes evolve, two key dimensions of interoperability are typically encountered: domestic and cross-border interoperability

As schemes evolve and gain scale, strategic ambitions will typically fuel a desire to scale even further through some form of interoperability.

There are various dimensions of interoperability, which are generally grouped into the objectives being sought and how to achieve those objectives.

Objectives:

- Geographic focus:
  - Domestic interoperability versus cross-border interoperability
- Directionality of interactions
  - Inbound versus outbound interoperability

How to achieve these objectives:

Agreement structures

- Bilateral versus multilateral at proprietary or national levels
- Integration approach
  - Harmonised QR code versus back-end integration (typically API)

This document will now focus on the technical aspects of achieving interoperability, citing prominent examples of implementation approaches.

There are two primary approaches to QR code payments interoperability: harmonisation of QR code specifications and harmonisation via API and/or back-end integration

This diagram illustrates the two key approaches to interoperability, highlighting the differences between front-end (e.g. QR code) and back-end (API) harmonisation. It is important to note that:

- Interoperability schemes typically take either a harmonised approach to QR code specification OR involve some form of back-end integration via APIs.

- Interoperability does not require both QR code harmonisation and API integration, i.e. interoperability can be achieved using only one of these mechanisms.

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There are two primary approaches to QR code payments interoperability: harmonisation of QR code specifications and harmonisation via API and/or back-end integration

Interoperability approach

Harmonised QR code specifications	
Proprietary Scheme A	National Scheme A
Harmonised QR code	Harmonised QR code
Proprietary Scheme B	National Scheme B

Harmonised QR code example:
China UnionPay (CUP) customer travels to Japan, using UnionPay at Japanese JPQR merchants.

Proprietary Scheme A	UnionPay 银联
Harmonised QR code	EMVCo
National Scheme B	JPQR

API integrations		
Proprietary Scheme A	Proprietary Scheme A	National Scheme A
A's API or B's API	National Scheme B's API	NS A's API or NS B's API
Proprietary Scheme B	National Scheme B	National Scheme B

API example:
WeChat Pay customer travelling to Indonesia, using WeChat Pay to transact at QRIS enabled merchants in Indonesia.

Proprietary Scheme A*	WeChat Pay	
National Scheme B's API	QRIS	QRIS API
National Scheme B's Merchant acquirer	CIMB NIAGA	
National Scheme B	QRIS	QRIS merchants

For more insights and examples of QR code specification harmonisation, see Appendix D

* WeChat Pay in partnership with CIMB Niaga (using QRIS API). Similarly, Alipay has recently agreed to a deal with Indonesian state-owned banks, BRI and Bank Mandiri

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Key trends, findings and call to action

- There are many different approaches to the adoption of QR code payments, and trends and lessons can be drawn from existing deployments around the globe.

- Mobile money providers are actively promoting the use of QR codes for merchant payments in emerging markets, but they must also lay the foundation for interoperability.

- Call to action for mobile money providers

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As QR code merchant payments continue to grow in popularity, it is important to recognise not only the material trends, but also the impacts and implications of these trends

QR code merchant payments are not new, and there is a significant body of global knowledge and experience from providers operating in this ecosystem (with varying degrees of success).

Here, we examine some of the major trends in QR code merchant payments and their key impacts and implications.

Internet connectivity is required, but remains a challenge for many

- Some form of internet connectivity is required to support effective QR code merchant payments. Although there continues to be a keen interest in improving coverage, a number of regions still have limited or no coverage.

Government interest and intervention is growing

- Historically, governments and regulators have shown little inclination to intervene in the merchant payments segment. However, this appears to be changing around the world, particularly in developing regions where there is a desire to reduce the use of cash and counterfeit.

- Another key objective is to improve financial inclusion and literacy, which has fuelled efforts to increase the banked population.

- Regulators recognise that one way to achieve these goals is to reduce the cost of non-cash merchant payments to make digital payments more attractive.

- States benefit from all of the above through enhanced money traceability and, therefore, potentially higher tax revenues.

Smartphone penetration is increasing, but feature phone penetration remains high

- Smartphones are essential to the success of QR code merchant payments. Smartphone penetration is high in many of the regions where QR code merchant payments are popular (e.g. various Asian markets). However, this is not the case in many other markets (e.g. across Africa) where smartphone penetration is growing, but very slowly, and feature phone penetration remains high. In these regions, the affordability of devices is a critical challenge.

- Accelerating the penetration of affordable smartphones is vital, and pursuing a "bridge" smart feature phone platform in parallel, such as KaiOS, may help mitigate this challenge.

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As QR code merchant payments continue to grow in popularity, it is important to recognise not only the material trends, but also the impacts and implications of these trends

Interoperability is crucial at various stages of the QR code merchant payments journey

- Various forms of interoperability become crucial considerations at certain points in the QR code merchant payments journey. This is rarely a consideration in the early stages, but becomes an important factor later. Late consideration of this aspect can pose material challenges to scale and growth.

Payment giants are continuing aggressive global growth

- Alipay and WeChat Pay continue to build on their domestic success and are adopting a flexible approach to cross-border acceptance interoperability to ensure their customers are supported when they travel.

- This has effectively applied tacit pressure on foreign bodies and value chain players to enable interoperability in their domestic markets for inbound Chinese travellers.

- Alipay and WeChat Pay have also begun to open their ecosystem in China to those travelling to China, which could bolster their already dominant position.

Downward pressure on payment acceptance fees and costs

- There is consistent downward pressure on the costs and fees associated with merchant payments acceptance, including POS hardware. QR code merchant payments are seen as a potential solution to this challenge, particularly for micro-merchants.

Material difference in market approaches

- There are existing and emerging material differences in market approaches to QR code merchant payments across geographies (e.g. some are heavily regulator-led, others are fintech-led while others are MMP-led). A one-size-fits-all approach is unlikely to be successful.

Biometric payments are becoming more feasible

- Biometrics could ultimately replace QR codes (and other payment tokens).

- Biometric payment methods are slowly gaining profile around the world. China leads on this and could pave the way for biometrics, such as fingerprint and/or facial recognition to replace payment tokens (e.g. QR codes) and their host devices (e.g. smartphones) for payments entirely.

QR code merchant payments: an interim step towards NFC payments?

- In some cases, QR code merchant payments are seen as an interim step or bridge to NFC payments.

- Major international payments schemes see the potential, but also recognise that this may not be the path some (non-card dominated) regions will take.

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Findings: there are many different approaches to adopting QR code merchant payments, and lessons can be drawn from deployments around the globe

The impact of these approaches will vary depending on where the provider is on its QR code merchant payments journey.

Key headline findings:

Crucial enablers and interdependencies

- Components of the ecosystem are heavily interdependent. As a crucial first step, it is important that target customers have easy, affordable access to appropriate devices, connectivity and bank accounts. However, it takes time for a market to shift from feature phones to smartphones, as does convincing cash merchants to move to digital payments.

Evolutionary journey

- It has been demonstrated repeatedly that there are key milestones along the QR code merchant payments journey. These highlight the evolving, non-linear nature of the journey, and may require backtracking to ultimately gain forward momentum.

Geographic nuances

- A clear and deep knowledge of target markets is required, and a one-dimensional approach is unlikely to succeed. For example, it is important to recognise that different populations have different needs (e.g. payments challenges in rural areas will be different from those experienced in cities) and markets with deep smartphone penetration will behave differently from feature phone markets.

Education and trust

- Ecosystem participants must have trust and confidence in QR code ecosystems if they are to thrive. Robust and continued education of all stakeholders, especially merchants and customers, is necessary to build and embed trust. This can be achieved in a variety of ways, such as promotions by large and trusted retail brands, or enlisting government support (where the government is a trusted entity).

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Findings: there are many different approaches to adopting QR code merchant payments, and lessons can be drawn from deployments around the globe

Key headline findings cont.

🏛 Regulatory intervention

- Increasing government and regulatory appetite for intervention requires careful consideration of their agenda and determining how to feasibly address these priorities in a proposition.

🔄 Distribution

- Distribution is key. Ubiquitous merchant and customer uptake is essential to the success of these types of payments initiatives. Providers will need to resolve the "catch-22" challenge of merchants waiting for customer demand before moving to support this demand, while customers wait for their favourite merchants to support the scheme before signing up for it.

🎯 Strategic objectives

- Clear, concise and executable strategic objectives are required throughout the journey, but these should be reviewed regularly and recalibrated when required. For example, if success is likely to depend on interoperability, do not leave interoperability until the last minute.

- One of the main perceived benefits of QR code merchant payments is the potentially low cost of entry and participation for merchants and customers. It is important not to lose sight of this to ensure that QR code merchant payments remain the most compelling option for stakeholders that place high value on affordability.

- On their own, QR code merchant payments are typically a difficult financial proposition for providers. These payments should support the consumption of high-value products and services that are the core drivers of revenue and profitability.

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Mobile money providers are actively promoting the use of QR codes for merchant payments in emerging markets, but they must also lay the foundation for interoperability

QR code merchant payments have already been widely adopted in specific markets like China, but are still in an early part of their journey in other parts of the world, particularly emerging markets.

Mobile money providers are key players in the provision of financial services in emerging markets and are actively promoting the use of QR codes for merchant payments there.

They can leverage their leading position in these markets to capture the opportunity presented by QR code merchant payments, but should **adopt the lessons emerging from other QR code deployments globally.**

QR code merchant payments are a complex proposition with many moving parts in terms of their product flow and technical specifications, as shown in this report. It is important the mobile industry aligns on the specific aspects of a QR code merchant payment solution to achieve a harmonised experience for customers across providers.

To enable this, the mobile money industry may consider **adopting an existent harmonised QR code specification** that meets its needs or **developing a bespoke new one** that is tailor-made to address its requirements.

Conclusion

QR code merchant payments present a significant growth opportunity for mobile money providers.

Longer term, sustainable growth will be underpinned by the industry's willingness to collaborate.

Non-telco players are already investing heavily in this opportunity.

There is currently an early-mover opportunity for the industry. This window of opportunity will not remain open indefinitely.

Appendices

Appendices available upon request:
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For more information on
GSMA Mobile Money,
visit gsma.com/mobilemoney