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Mobile Payments Industry Overview

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Contents

Introduction	3
Mobile Payment Technology	5
Mobile Payment Models	8
Bank Branch Penetration Across Geographies	9
Number of Mobile Payment Users by Region	9
Global Mobile Payment Spending	10
Global Mobile Spending by Segment in 2017	10
Disruption of Traditional Banking	12
Regulatory Framework	12
Future of Mobile Payments	14
Gen Z Far Outpaces Other Age Groups in Mobile Payments	14
References	16

Introduction

The traditional payment industry is going through a technological transformation, which is fundamentally disrupting legacy business models. The mobile payment industry is expected to revolutionize the way we make payments, as it merges newer technological innovations, such as wearables, biometrics, and additionally, blockchain technology. Needless to say, the industry could witness momentous shifts and offer unprecedented opportunities to the existing and new players.

Mobile payments refer to payments done through a portable electronic device, such as a cell phone or a tablet. It is an alternative to using cash, checks, or credit cards. This technology can be used to send money anywhere, anytime, using mobile devices from the initiation stage to the realization of the transaction, and it includes confirmation and authorization as well.

Brief History of Mobile Payments

Mobile payment adoption has been varied across markets owing to the differences in their economies, regulations, and banking infrastructure. Geographically, Asia Pacific (APAC) was the first one to adopt mobile payments, due to the existence of a large, unbanked, economy, followed by Europe and North America. Though the early mobile transactions are recorded in the late 1990s, the first patent that defined “mobile payment systems” was filed in 2000.^{1,2,3} In 1997, Coca Cola introduced vending machines in Helsinki that allowed consumers to buy the drink through a text message – making it the world’s first instance of a mobile payment transaction. In 1999, PayPal was launched as a money transfer service. This was followed by the emergence of mobile wallets that were used to buy movie tickets, pizza, etc. In 2011, Google launched Google Wallet, making it the first large company to provide a mobile wallet. With the wallet, consumers could make payments, earn loyalty points, and redeem coupons. In 2012, Apple introduced Passbook to be used for buying boarding passes and airline tickets. Apple Pay was launched in 2014, and Android Pay and Samsung Pay followed a year later.^{4,5}

Ecosystem

The modern payment processing ecosystem involves a complex network of consumers, merchants, banks, and payment/network processors. It is heterogeneous, not only from the perspective of different types of operators, but also due to the existence of various technologies and operating models. Banks are the traditional operators in this space. However, the growth in mobile payments has seen new entrants, such as financial technology companies and mobile phone manufacturers, increasing their share. To lead the way for the future of mobile payments, technology companies are attempting to change the landscape of mobile payments with innovative, software-based payment solutions with unique features driving more of the process onto their platforms. The industry is increasingly investing in enhanced security and convenience features. Local factors play a major role when it comes to the adoption of the technology. For instance, in emerging economies, the low level of banking penetration has played an important role in the development of mobile payment solutions as a provider of financial services.^{2,4,5,6}

Modes of Mobile Payments

Mobile payment technology is evolving rapidly, with various innovations being explored to shape the future of how consumers make digital payments through mobile payment gateways.

Mobile Wallets

A mobile wallet is simply a digital wallet. In a mobile wallet app, the user can add a card (debit or credit) and store the details associated with the card. This allows users to make payment for their purchases with mobile phones instead of using a physical card. One can use mobile wallets to make in-store payments and online purchases, pay for digital content, and transfer money. Users can also receive offers, cashback, and rewards on transactions made. Some mobile wallets allow withdrawal, but largely the app is restricted to payments and transfers. They

facilitate secure, speedy and hassle-free payments for purchase of goods and services. These wallets are economical and help lower the payment processing time and reduce fraud.^{7,8,9}

SMS Payments

Short messaging service (SMS) payment entails paying for products and services using a text message, which is sent via a mobile phone. In this form of payment, the purchaser sends a text message with all the necessary information concerning the transaction to mobile payment providers. The provider clears and settles the transaction between the vendor and the purchaser. The cost of the purchase is either added to the monthly billing statement or deducted from the pre-paid balance. SMS was one of the earliest modes of mobile payments before the advent of smartphones as the ability to text was all that was required. SMS payment is perceived as more convenient and safe, as the purchaser is not required to provide his credit card or bank details and no personal detail is shared during transactions. SMS payments are popular in Europe, especially for making payments for parking and buying bus/train tickets.^{7,8,9,10}

Direct Operator Billing

Operator billing is a way to pay through your mobile service provider, allowing subscribers to make purchases and place the cost onto their monthly phone bills. This service is facilitated by mobile service providers, who connect millions of consumers through the use of easy and quick mobile payments. This mode of payment does not use any banking infrastructure. The major benefits of using direct operator billing are financial inclusion and smooth customer experience. The major drawbacks are weaker security, high chances of fraud, and huge carrier charges.¹¹

Internet Payments

Apart from using mobile wallets, SMS payments, and direct operator billing, one could also make online payments through a phone browser, such as safari and chrome. This can be done either by manually entering card details on an e-commerce site, such as Amazon or by using mobile applications, such as PayPal. This method is known as wireless application protocol (WAP)¹² payment, which was commonly used prior to the advent of smartphones. WAP is essentially a technology used by a mobile phone to access the internet. This payment method requires a limited-capacity WAP browser and an internet connection.^{9,13}

Mobile Banking

Mobile banking is a commonly used application these days as most of the banks have their own mobile applications. Mobile banking refers to the use of phones or other cellular devices to perform online banking tasks. The user needs to sign up with the banking app and verify the details of the account. Each bank can have a different sign-up and verification procedure.^{9,14}

Mobile Payment Technology

Near Field Communication

There are two broad types of mobile payments technologies: proximity and remote payments. When both parties are physically in the same location, it is referred to as proximity payments. In this case, communication between parties is done directly using contactless radio technologies. Remote payments, on the other hand, can be done irrespective of the payer's location, and are performed using a communication link, SMS, or a mobile application.^{15,16,17}

Proximity-based mobile payments use different technologies to establish communication required for a successful transaction. These are also referred to as point-of-sale (POS) solutions.

Near Field Communication (NFC) is the most popular means of contactless communication between two devices. It allows users to wave an NFC phone over an NFC-compatible payment reader or card machine and transfer data without touching the devices. NFC-enabled devices create a radio frequency current captured by NFC-compatible payment machines using a radio frequency identifier in proximity that reads the information and processes the payment. NFC is actually a subset of radio-frequency identification (RFID) – a technology that allows identification using radio waves. Transactions do not need multiple levels of authentication to be successful and the benefits include convenience, security, and speed. One of the major disadvantages is that it needs an extra piece of hardware, usually not integrated into smartphones or POS devices. However, an increasing number of companies are now investing in this technology. Google has launched Google Pay, which supports Mastercard PayPass, and PayPal offers money transfers between smartphones.^{10,18}

Sound Wave-based Payments

In this technology, an algorithm is used to encode data into sound waves, which can be transmitted without the internet. A transaction begins when the payment device of a merchant generates a sound wave containing secured encrypted data for payment, which the mobile phone of a customer receives and translates into analog signals using the algorithm. The customer then needs to respond to this signal and authenticate to complete the transaction. Sound waves produced are unique to each transaction and not affected by other background sounds. This option does not require additional hardware (unlike in NFC), but needs software. This makes it an accessible solution in countries where smartphones are not affordable and people and organizations have to rely on basic technologies to process payments.^{9,19}

Magnetic Secure Transmission

This technology uses a magnetic signal to transmit information. Magnetic signals, which are similar to the magnetic strip on a traditional payment card, are picked up by card terminals and payments are processed. This technology works at nearly all payment terminals that have a card reader and does not usually require any additional software. It is a more secure way to transfer payment information than any other contactless communication, as it uses a system known as tokenization, where a card's number is converted into a unique alphanumeric identifier using proprietary algorithms. The unique identifier is then sent to the card's payment network, where it is decrypted and the transaction authorized. The actual card number is stored in a secure vault with the payment processor and does not remain on the merchant or the mobile wallet provider systems. Samsung Pay uses magnetic secure transmission technology to enable digital payments.^{20,21}

Quick Response Code

The Quick Response (QR) code is a new type of barcode read by digital devices, such as smartphones, which are equipped with a camera. The QR code is an advanced form of the older version of the two-dimensional barcode. It contains more information and is frequently used to track information on products. It is also used in making payments. QR codes consist of black squares in the form of a matrix or a grid with a white background. The QR code reader extracts data

from the pattern in the QR matrix. With the aid of QR codes, banks can offer multiple services including utility fund transfers, bill payments, mobile top-ups, and peer-to-peer or peer-to-merchants fund transfers. For every transaction, a seller presents the QR code to its customer to make a payment. The QR code contains information, such as bill number, bill amount, bank details of the seller, and all the other relevant information required to complete the transaction. The customer scans the code using an installed mobile application, and the amount is then deducted from the customer's digital wallet. Consumers can, thus, complete payments in seconds. The technology is secure, as personal data does not get compromised. Merchants, too can save on payouts made to banks and ensure that data theft does not originate from their outlets.^{22,23,24}

Mobile Payment Players

The mobile payment universe is expanding rapidly, as even non-banking entities, such as telecom operators, technology companies, and smartphone manufacturers, have moved into the space to participate in what is perceived to be a significant opportunity. Firms, irrespective of their past credentials in the financial sector, are finding it tough to resist the lure of the market. Therefore, we have smartphone manufacturers, like Samsung, and tech giants, like Google, entering the mobile payment landscape and competing with traditional banking and financial players.

Banks and Financial Institutions

Banks and financial institutions (FIs) – traditional players in the mobile payment services segment – are looking to leverage existing banking infrastructure and customers' trust. They have been handling payments securely for years, giving them an edge over their rivals. The Bearing Point Institute surveyed customers in the euro region and the US and found that most of them rate banks as their preferred mobile payment providers, given their trust in the banking system. With their business expertise and investments in technological innovation, banks and FIs can continue to hold their ground. The 2017 survey by Federal Reserve Bank of Boston found that a higher number of FIs are offering mobile banking services to consumers and increasingly to commercial entities. About 89% of respondents had already started offering mobile banking services, while 8% were planning to provide in the next two years. In Sweden, six of the largest retail banks have developed a mobile payment app named Swish, which is used by nearly 50% of the population.^{2,25,26,27}

Mobile Operators

The demand for mobile payments through mobile operators is increasing owing to the simplicity and security of the process. With their average revenue per user decreasing worldwide, telecom operators are investing heavily in mobile payments to diversify their revenue streams. In emerging markets, where banking penetration is low, customers make mobile payments through mobile operators. Telecom companies already have the necessary consumer data and can increase their market share in payment solutions by investing in areas like partnerships with merchants and providing various payment options, thereby enhancing customer experience. In Asia, Telenor Pakistan is an interesting example. In 2015, the operator required re-registration of all its active SIM cards. The company took this as an opportunity and began providing mobile financial services to customers by utilizing the biometric data that it gathered in the process. As per ACI Worldwide, telecom operators' share in mobile payments in Europe could quadruple to €13.3 billion in 2022 from €3.4 billion in 2017 if they implement these initiatives.^{4,28,29,30}

Smartphone Manufacturers

Apple Pay, Google Pay, and Samsung Pay are some of the most popular mobile payment solutions in the world. Their solutions are simple and compatible with many merchant card readers, credit cards, and banks. Juniper Research estimates the combined market share of Apple Pay, Samsung Pay, and Google Pay in mobile payment to touch 56% by 2021 in the US. Google Pay allows POS pur-

chases of goods and services; the company has announced that Google Pay will be integrated into other Google apps (including Google Assistant, Chrome, and Play Store) and that users will be able to make peer-to-peer payments and purchase online on the ecommerce market. Apple Pay, developed in collaboration with Visa, Mastercard, and American Express, uses the NFC technology to make contactless payments at POS systems. Samsung Pay, in addition to the NFC technology, uses magnetic secure transmission (MST) for mobile payments.^{31,32}

Technology Companies

Successful players in the mobile payment space include technology companies or rather fintech firms. It is a wider segment, with companies providing innovative technologies for digital payments, such as Visa and Mastercard, online payment systems including PayPal, or both. Innovative technologies could assume the form of a network, apps, or POS solutions. Firms providing payment solutions are also called third-party mobile payment providers. They have received wide recognition from consumers and grown rapidly in the last few years. Their simple and user friendly payment solutions offer attractive schemes to draw new customers. These companies have grabbed revenue and market share from FIs.^{33,34}

Mobile Payment Models

The above players operate through different economic models- bank-centric, operator-centric, collaborative, and independent service provider.

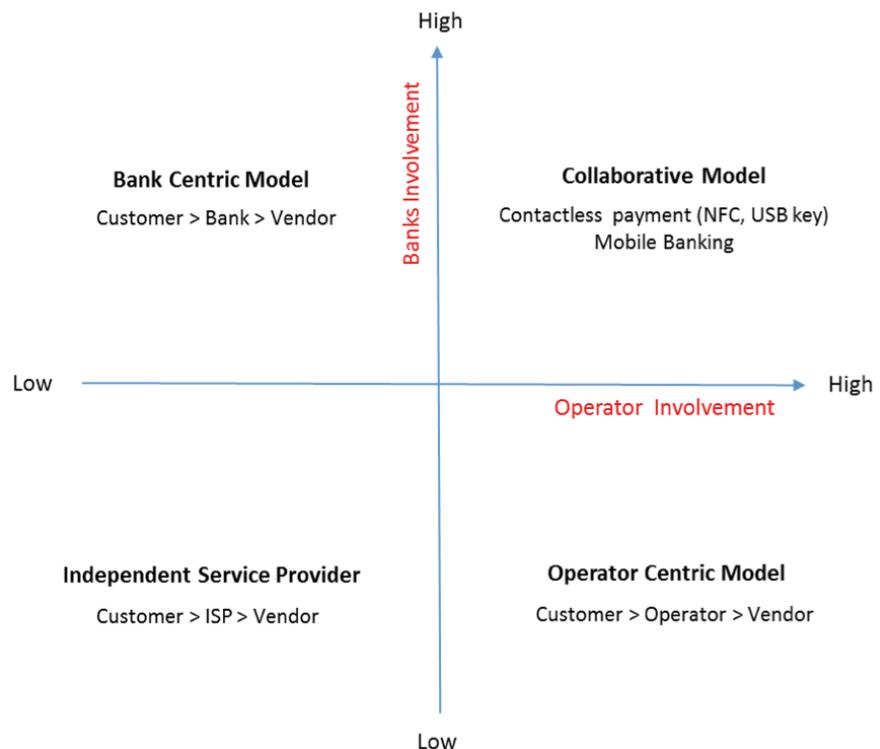
In the bank-centric model, banks act as intermediaries between the money transferor and the receiver, providing technology know-how and collaborating with other banks and operators to provide mobile payment solutions. For example, Amex Pay – a mobile payment solution from American Express – helps customers make mobile payments faster, securely, and conveniently. Banks have a large customer base in comparison with the other players in this space (tech giants, operators, and smart phone manufacturers), which provides them an advantage.³⁵

In the operator centric model, the telecom operator plays a strategic role. It provides technology and manages transactions. Here, a customer can either prepay or the operator can add charges to the existing bill. This type of model is very popular in less developed countries, where the percentage of people holding a bank account is low. M-Pesa in Kenya is an example of the operator-centric model.^{33,36}

The collaborative model essentially involves established players and new entrants. Banks, telecom operators, and sometimes third-party service providers collaborate to develop mobile payment solutions. This is one of the most successful models, as each party works on its core strength. Banks will leverage the strength of their financial infrastructure, while operators add value through their transmission networks.³³

Under the independent service provider model, a third party acts as an intermediary between transacting parties. Google Pay, Apple Pay, and PayPal are some of the most popular independent service providers in mobile payments. A consumer just needs to have a bank account, a smartphone, and an email address to access the application. Payment solutions offered are simple and user friendly. For example, using Google Pay, customers can send, request for, and receive money from others and locate stores that use Google Pay. This application can also store customers' credit card, debit card, and loyalty card details and allow them to select the card they want to use for a transaction. It does not use existing wire transfer or card networks and is a relatively new model in the mobile payment space.³³

Mobile Payment Models



Source: Laetitia Chaix and Dominique Torre, "Four models for mobile payments, February 2011"

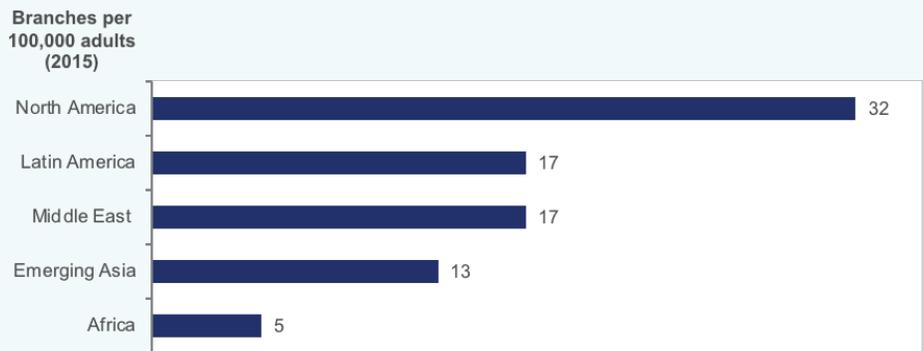
Global Use Trends

The rising popularity of smartphones and developments in the technology and security spaces, together with changing preferences of the younger generation, have made mobile payments one of the most preferred payment options for many.

Mobile Payment Usage Across Geographies

Mobile payment use is growing much faster in emerging economies than in developed markets. Emerging economies have a large unbanked population, as banking services are either not available or unaffordable. This exists against the backdrop of fast and widespread penetration of smartphones across income categories, especially in fast-growing emerging economies such as India and China. Together, they have driven the growth of the mobile payment market in these economies. Emerging economies also have a significant number of migrant workers, and their need to transfer funds home has boosted mobile payments, including cross-border transactions.³⁷

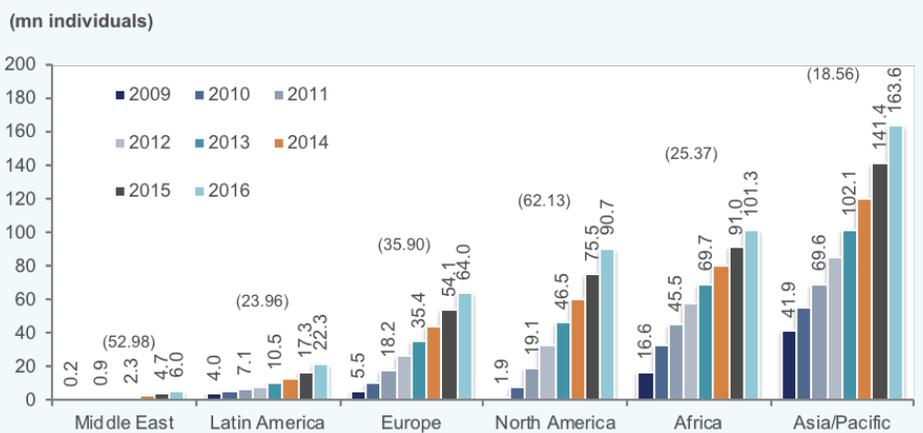
Bank Branch Penetration Across Geographies



Source: Quartz Africa

Region wise, Asia/Pacific has the largest number of mobile payment users, followed by Africa and North America. In 2016, Asia/Pacific had 163.6 million users, while there were 101.3 million users in Africa and 90.7 million in North America. North America registered the largest growth during 2009-2016 (CAGR of 62.13%), followed by Europe (35.90%) and Africa (25.37%).³⁸

Number of Mobile Payment Users by Region



(*2009-2016 CAGR, %) Source: www.statista.com, 2018

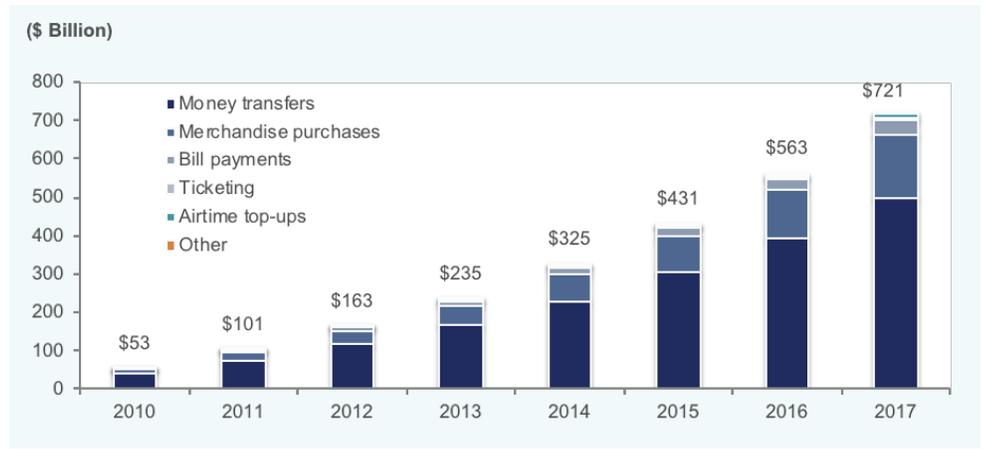
The adoption of mobile payment technology has been impressive in Sub-Saharan Africa, with various operators offering diverse services such as M-Pesa, MTN Mobile Money, Tigo Pesa, Orange Money, Vodafone Cash, and Airtel Money. Mobile money has dramatically improved the region's financial inclusion. In 2016, over 40% of the adult population in Kenya, Tanzania, Ghana, Uganda, Gabon, Paraguay,

and Namibia were reported as active mobile money users, compared to just two countries (Kenya and Tanzania) in the prior year.

Kenya is a remarkable example for the progress Sub-Saharan Africa has made in mobile payment. Safaricom, Kenya’s largest mobile-network operator, launched the country’s payment system M-Pesa in 2007, and it went on to become tremendously popular. M-Pesa was launched as a simple way of texting small payments between users. Since M-Pesa users don’t need to have a bank account or a credit history, it became a viable option for many Kenyans, primarily the low-income group from rural areas who were not captured by banking institutions. Today, M-Pesa offers a range of services, including loans, international transfers, and health provision. It is actively used by 20 million Kenyans – over 40% of the population. M-Pesa is so widely accepted and popular that it is often referred to as Kenya’s alternative currency. In 2016, it processed around six billion transactions at a peak rate of 529/second.^{39,40,41,42,43,44}

Globally, spending through mobile payments increased significantly during 2010-2017. Spending increased from \$53.0 billion in 2010 to \$721.4 billion in 2017, growing at a CAGR of 45.2%.

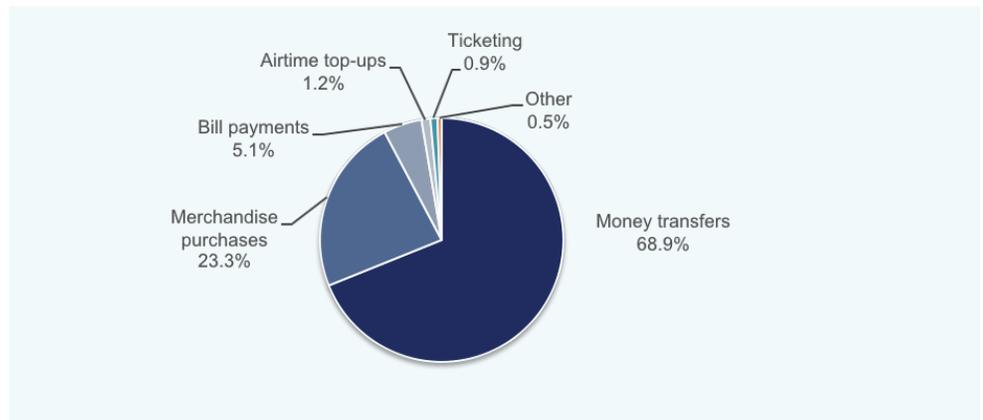
Global Mobile Payment Spending



Source: www.statista.com, 2018

During 2010-2017, money transfers accounted for the bulk of spending, followed by merchandise purchases and bill payments. In 2017, money transfers, merchandise purchases, and bill payments made up 68.9%, 23.3%, and 5.1%, respectively, of global mobile payment spending.

Global Mobile Spending by Segment in 2017



Source: www.statista.com, 2018

Mobile Payment User Demographics

The growth in smartphone use and the younger generation's affinity toward mobile devices has significantly contributed to the growth of mobile payments. IHS Markit forecasts the global smartphone base to reach over 6 billion by 2020, up 50% from just 4 billion in 2016.⁴⁵ About 83% of millennials (people born between 1980 and 2000) own a smartphone.⁴⁶ Payfirma estimates that 87% of millennials use 2-3 technology devices at least once a day and 82% check their devices within one hour of waking up. By 2025, millennials are expected to make up 75% of the global workforce.⁴⁷ In the U.S. alone, millennials are expected to reach 73 million by 2019, overtaking the baby boomer generation (72 million).⁴⁸ Further, according to TNS's global Connected Life study, an average millennial with internet access spends 3.2 hours a day on mobile devices, equivalent to one day a week.⁴⁹ Another study by JWT found that 44% of millennials would use their mobile to purchase small items and 45% prefer mobile payments when sharing expenses with friends.⁵⁰ As millennials are early adopters of mobile payments, they are hyper-connected and prefer a cashless society. Similarly, about 76% of Gen Z (people born in 1995 or later) own a smartphone. This generation, also known as the smartphone generation, is naturally digital, as they have not lived without the internet.

Disruption of Traditional Banking

As mobile payments fulfil the demand for cheaper, faster, and convenient services, traditional payment service providers, such as banks and credit card companies, are facing major challenges. Traditionally, to accept credit cards, businesses needed the assistance of banks or landline telephone. Mobile payment systems have done away with this requirement, making them ideal for mobile market vendors. Furthermore, unlike banks' credit cards, mobile payment does not have to ensure a fixed volume of transactions to qualify for an account, making it ideal for small businesses.⁵¹

Lower transaction costs associated with mobile payments are another incentive for customers and businesses to move away from traditional forms of payments and save large sums in the long run. Bank payments and the use of cash involve transaction fees for calculation, counting, and storage, among others, which generally add to the transaction cost. Similarly, in accepting debit and credit cards, businesses have to pay monthly fees and per transaction fees to banks, adding to their costs. Mobile payments enable businesses to avoid these expenses. Additionally, banks are facing regulatory pressure to cut fees they charge for payments and cooperate with fintech firms.⁴⁰

Customer concerns on the safety of transactions facilitated by traditional payment service providers are rising, as they are increasingly falling victims to cyber-attacks from sophisticated hackers and digital criminals. On the other hand, mobile payment platforms boast dynamic authentication protocols.

Under the second Payment Services Directive (PSD2) in Europe, banks are required to provide customer data to third-party qualified payment service providers. This requirement, intended to enhance competition and innovation in the sector, could prove to be counterproductive for banks, as companies such as Google, Facebook, or Amazon could aggregate all financial information about an individual from different accounts into one site and provide payment services through their portal.^{52,53}

Mobile payment regulations worldwide primarily aim at risk reduction, standardization, competition and transparency, and innovation.

Risk reduction: The top priority of all regulations is to reduce risk and fraud and ensure the security of mobile transactions in the global mobile payment industry. Regulations, such as Regulation E (US) and PSD2 (European Union), aim to ensure the security of mobile transactions.

Standardization: With both developed and emerging markets adopting mobile payments and the adoption of different technologies and business models in the marketplace, the standardization of the industry has become the focal theme for many regulations. Standards in payments, clearing regulations, and data privacy directives are aimed at fulfilling this objective.

Competition and transparency: Promoting competition and providing transparency are vital to the growth of the industry. Payment governance, regulations concerning prepaid payment products in North America, and pressure on card interchange fees are initiatives in this area.

Innovation: Encouraging innovation is paramount for the growth of the industry. The updated PSD 2 in the European Union, the UAE's Mobile Wallet, Current Account Switch service, and E-invoicing seek to foster innovation in the industry.^{54,55,56}

In the US, Regulation E provides the basis for developing a regulatory framework for electronic fund transfers (EFTs) for individual consumers. These regulations apply to mobile payments, as the underlying payments in mobile payments are from a consumer's account and through EFTs.

Rules under the regulation establish customers' right to disclosures regarding

Regulatory Framework

Electronic Fund Transfer Act (EFTA) /Regulation E

the terms and conditions of EFTs. It also stipulates an error-resolution mechanism for consumers in case of erroneous or unauthorized transactions. Further, customers must be told up front how error resolution works. The regulation is, however, limited to individual accounts setup for personal or family purposes and does not protect non-consumer accounts such as Partnership, Corporations etc.^{57,58}

EU PSD2

PSD2, an improved version of PSD, aims to develop an efficient and integrated payment market across the European Union that would encourage innovation and enhance safety. Major changes introduced by PSD2 over PSD include:

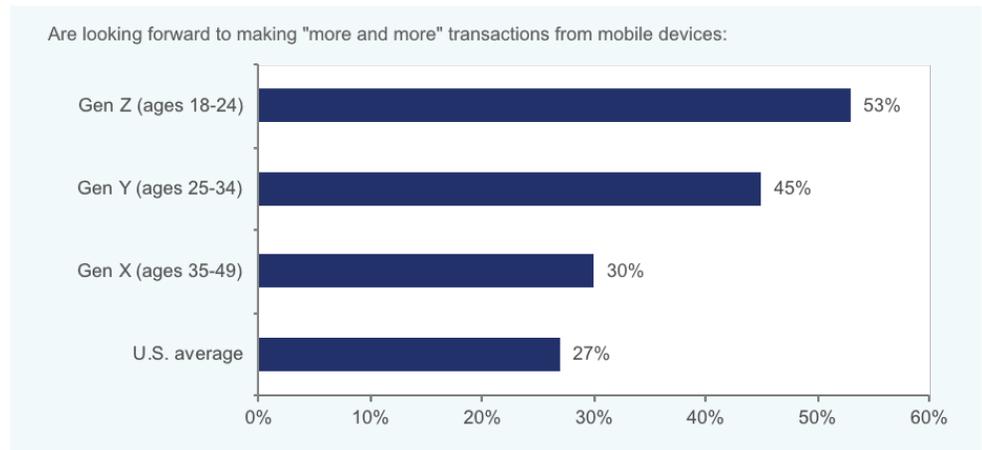
- Account information service providers (AISPs) and payment initiation service providers (PISPs) have been added to the list of third-party payment providers (TPPs). They are expected to bring new technologies (using artificial intelligence) and provide faster services.
- Banks should provide AISPs clients' historical transactions and payment data upon clients' request. This enables AISPs to better use client data to provide value-added services.
- A strong customer authentication tool is required, with two or more elements for identification, such as knowledge (password), possession (device), and inherent (biometric print).⁵⁹

Future of Mobile Payments

Factors that have been driving the current mobile-payment industry will continue to do so in the future. The rise in mobile phone users globally, shift from feature phones to smartphones, and rising population of millennials and Generation Z are expected to provide a massive boost to the mobile payment industry. China's cashless revolution, being driven by millennials, is a remarkable example. About 50% of the world's digital payments in 2017 were made in China. In 2017, the total value of China's mobile payment transactions overtook the combined value of worldwide payments done through Visa and Mastercard.⁶⁰

The global mobile payment market is expected to grow at a CAGR of 34% from 2017 to 2023. The SMS payment segment is expected to grow at a CAGR of 33.5%, dominating the industry during the forecast period. The mobile payment industry in emerging economies in Asia-Pacific is expected to grow at the highest rate during the forecast period, whereas among applications, the hospitality and transportation sector is expected to report the highest CAGR of 35%.⁶¹

Gen Z Far Outpaces Other Age Groups in Mobile Payments



Source: Gfk 2015 FutureBuy research

How Will the Mobile Payment Industry Shape Up Going Forward?

Demise of physical cards: Over the past three years, the global fintech sector attracted investments worth over \$122 billion. A chunk of these funds have been invested in finding new ways to process payments. The World Economic Forum forecasts such huge investments will dent credit card volumes in the future as the mobile payment industry starts to offer innovative alternatives to physical cards. The convenience and ease of use provided by Apple Pay, Samsung Pay, and Android Pay continue to appeal mobile users. The Institute of Electrical and Electronics Engineers (IEEE) also predicts that mobile payments could make cash and credit cards redundant by 2030.^{62,63,64,65,66}

Rise of wearables: Wearables are expected to play an important role in the future of mobile payments. Wearable devices include wristbands, watches, rings, and other accessories. Anything we wear that can be equipped with the NFC technology can be part of a wearable payment system. Digital payment technology embedded in wearables allows a person to make a payment just by waving or tapping the device on a POS terminal even without an active internet connection. Digital payment companies are also exploring the use of Bluetooth and proximity sensors to process payments. Payment-enabled accessories are not limited to wearables. In the 2018 Winter Olympics, a South Korean company offered payment-enabled lapel pins, payment-enabled gloves, and prepaid stickers. These stickers have the potential to transform anything into a payment device.^{67,68}

Payment with a selfie, fingerprint, or retina scan: Biometric payments are expected to be the next disruptive technology in the mobile payment industry. A biometric payment system works by analyzing biological traits unique to an individual, such as DNA, fingerprint, or facial features. The use of fingerprint and facial scan has already become mainstream for unlocking smartphones. Owing to the convenience and security that biometrics provides, it is expected to replace

traditional digital identity schemes on a global scale. About 60% of smartphones to be launched in 2018, including mid-range ones, are expected to have fingerprint sensors. Acuity Market Intelligence forecasts that, by 2022, there would be over 5.5 billion biometrics-enabled mobile devices processing over 1 trillion transactions annually, driving the market's annual revenue to \$50.6 billion.^{67,69,70}

Impact of Growth of Blockchain Technology

The mobile payment industry is already shaking up the traditional payment industry. Going forward, the union between mobile payments and the blockchain technology could turn disruptive, as the combination could revolutionize the way the mobile payment industry operates. According to the World Economic Forum, by 2025, blockchain or blockchain-related technology will store about 10% of the world's GDP. Going forward, the application of blockchain technologies to facilitate mobile payments is expected to increase as the demand for faster, cost-effective, and secure payment platforms increases.⁷¹

Security: The ever-increasing use of mobile payments has increased the possibility of cybersecurity risks associated with digital transactions. Blockchain can mitigate inherent security risks in mobile payments by providing a highly secure platform for identity verification and the authentication of user data. In blockchain, all transactions are encrypted, time stamped, and accounted for on a ledger considered tamper-proof, thereby preventing frauds and double spending. Blockchain provides a decentralized database accessible to all network users (a chain of computers). Moreover, every transaction is confirmed and recognized only after it has been approved by all the users in the network. In 2017, IBM launched a cross-border blockchain payment service for a Polynesian payment system provider. IBM's blockchain platform enables the payment network to exchange 12 different currencies electronically.^{72,73,74,75}

Cost-effectiveness: Currently, a financial intermediary (a bank) is used to perform financial transactions. According to the World Bank, the average cost of remittance across the globe is 7.5% (10% for commercial banks). Cross-border payments, which generally pass through several financial entities, involve a lot of fee before reaching the beneficiary. Blockchain enables consumers and providers to communicate directly with each other, eliminating the need for a third party and consequently expensive service and transaction fees.⁷²

Instant P2P payments: With further developments in the blockchain technology, payments are expected to become very fast. It would be possible for a person to send money to another person living anywhere in the world in seconds. The beneficiary will be able to access these funds on his/her smartphone. This could also benefit the peer-to-peer lending industry – one of the fastest growing fintech industries in the world.⁷²

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