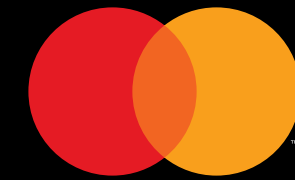


Welcome to the frictionless future





Here's to a future
where money keeps
pace with the
way we live, work
and do business:
invisibly, intuitively,
intelligently.

Foreword

A profound shift is taking place in payments. A shift that will redefine the future of our business and many others across the digital ecosystem.



The way we pay and get paid has changed dramatically over the last decade. What used to be done by cheque or cash is now done electronically in an instant. Think about how much easier it is for an individual to make a purchase: a tap of a card; a touch of a phone. Think about how much easier it is for a business to pay an employee: direct deposit; no more paper cheques. Think about the flicker of a second it takes a payment to be made...

Technologies and business models are developing at lightening speeds to open up more opportunities and connections to people around the world. Payments can be authenticated using our unique biological metrics, linked to our protected digital identities, and work intuitively in the background of our everyday lives. Our money now has personality and behaviours to complement our own.

These incredible advances offer a glimpse into what doing business, trading or living internationally, and making everyday spending decisions will look like in 10 years from now: simple, seamless and secure; for everyone, everywhere; with any device, or no device.

JOIN THE CONVERSATION

mastercard.com/frictionlessfuture
#FrictionlessFutureofPayments

At Mastercard, we are proud to be driving change and innovation, not simply reacting to it. The pages that follow summarise our experts' insights and foresights on the future of payments; they examine the critical driving forces and current initiatives that are already beginning to transform our communities and businesses for the better.

We've made these predictions knowing we've already embarked on the journey today. I invite you to share your vision of the future of payments, and join us in enabling that future together.

Michael Miebach
Chief Product Officer

Introduction

In 2019, we embarked on a project to explore the future of payments and financial services.

“There’s a shift happening in payments because the way we work and the way we live is changing.”

Liz Oakes, Executive Vice President for Market Development

To help us understand what that future will look like, we put the question to senior leaders across our organisation: “Open your minds,” we said. “How will the payments landscape have changed in 10 to 15 years’ time?” Their responses gave us plenty of food for thought.

Some assertions we could have predicted: “We’ll be less reliant on cash,” they said; “real-time payments will be the norm,” agreed most. Crime-fighting super computers, a Carphone Warehouse for banks, and behavioural authentication solutions were among the more imaginative suggestions.

They warned against the increasingly velocity of money laundering, and they predicted the growth of digital giants in the payments space. One even suggested that a hundred years from now the concept of money might cease to exist.

It proved an insightful exercise, which revealed many common threads – some surprising, others less so. As we reviewed the interview transcripts a central theme began to emerge: the resolution of friction and fragmentation in payments.

When we probed our subjects to consider how Mastercard was enabling this vision of the future, they spoke of solutions that allow money to move seamlessly between people, businesses and governments... and across borders; smarter, automated payments that click into place just in time; innovative digital solutions that reach the parts of the world banks can’t.

Together, they painted a picture of a world where common standards and processes break down barriers to international trade, where payment systems and schemes are connected – and protected. Where people and communities thrive.



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Intuitive payments

Queuing at checkouts is extinct; We pay using our biometric ID. Smarter digital solutions combine convenience and control to take the hassle out of payments.

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Common standards and processes break down barriers to international trade. Global networks are secure, transparent and resilient — providing certainty in every payment.

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Digital payments technologies reach the parts of the world banks can't, empowering individuals and businesses. Open ecosystems level the playing field for competition and innovation, helping the economy to flourish.

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Advanced authentication solutions give people control over their money and data. Intelligent algorithms prevent payment fraud before it occurs; we're closing the net on the bad guys.

CHAPTER 1

Intuitive payments

In the frictionless future, queuing at checkouts is extinct; we pay using our biometric ID. Smarter digital solutions combine convenience and control to take the hassle out of payments.

"Payments will be more passive and consumption uninterrupted, with seamless payments taking place in the background, keeping pace with the lives of customers."

Paul Stoddart, President of New Payment Platforms



Technology will eliminate checkouts from the shopping experience. Our money will work smarter and harder as payments blend into the background.

Resolving friction at the point of sale

The past decade has seen significant change in payments. As modern economies move decisively away from cash and cheques, digital payment experiences have evolved considerably too — the introduction of 'wearables' like pre-paid rings and smart watches are slowly gaining traction as more convenient means of payment than taking out a card or phone.

The future will bring the introduction of alternative means of payment at the point of sale. Declining use of cards, perhaps, but a wider range of choice for consumers, such as paying directly from their bank account. Looking further ahead, we expect biometric technologies to move beyond authentication to serve as the means of payment itself. No cards, accounts or wearables — our body language will be our ID.

Meanwhile, we'll see payments increasingly embedded in the shopping experience. Radio frequency (RFID) technology will drive the growth of checkoutless stores — where systems automatically ring-up the items in people's baskets and take payment without them needing to visit a cashier. These solutions will create a future where money follows our pace.

The Internet of Things — the extension of internet connectivity into physical devices and everyday objects — will provide more contextually appropriate ways for consumers to pay: connected fridges as a portal to grocery stores and connected cars as a point of interaction with fuel and parking merchants. Combine this with geolocational tracking, and we could see a future where payments for experiences like taking public transport or visiting a theme park are completely passive.

The online shopping process, will evolve too. Secure ways for people to store their payment, shipping and billing information — and authenticate those payments — will be seamlessly integrated with the digital experience.

The maturation of artificial intelligence (AI) will continue to fuel the rise of autopilot solutions that perform tasks without needing consumer intervention. Digital assistants will automate day-to-day cash decisions, including everything from spending loyalty points and cancelling unused subscriptions to financing credit cards. We might also see the introduction of predictive technologies that anticipate the purchases a person is likely to make, such as a regular morning coffee, to help them budget more effectively.

Redesigning business models using AI could create a whole new suite of personalised services — such as auto-refinance on a mortgage, booking pre-sale experiences, or on-the-spot retail shopping price adjustments — to be conducted seamlessly. Autopilot solutions like these have the potential to deliver a new era of access to money and services.

Importantly, payments will become invisible but not opaque: Embedding rich purchase information within the transaction will provide insights on a payment-by-payment basis, giving people a full picture of where, when and why their money is spent.

"We intend to
make the payment
experience easier
than the shopping
experience."

Ian Gausden, Executive Vice President for Specialist Sales





Sending money to friends, family and service providers will be dynamically integrated with our digital experiences.



Enabling seamless money transfers

Many people are reluctant to share their bank account information, and entering a series of numeric codes (using touchscreen keypads) is time consuming and prone to error. In future, it will be easy to make a payment to anyone anywhere, using any form of unique identifier — a mobile number, email address or citizen ID.

We hope to break down silos between cards, accounts and digital wallets so there's no barrier to paying people and businesses how, where and whenever we want.

And the way we make these payments will change too. In the not-too-distant future we predict a proliferation of conversational chatbots and voice-activated payment initiation services, making the act of sending and receiving money more human.

"No matter how you care to transact, we make it happen."

Greg Boosin, Executive Vice President for Product & B2B Marketing

Paper bills and invoices will be replaced by electronic payment requests that we fulfil quickly and easily, with full control.



Simplifying bill payments

We expect the bill pay experience to become increasingly digital and automated. Direct debits will grow around the world to allow people to spread the cost of one-off bills or expenses over a period, reduce their risk of late and erroneous payments, and reduce the hassle associated with current paper-based systems.

Consumer applications that aggregate bills and billers will offer positive friction. Receiving a payment request that can be seen against the current balance in the account will help people improve household budgeting and allow them to take corrective action if they don't

have enough money available. In future, we could see applications of AI to help people overcome other budget challenges – a digital assistant that calculates how much money a person has left each month, and automates regular payments in irregular instalments.

We hope to see a solution for delegated bill payments, for example if a child asks a parent to pay or authorise a one-off expense like a school trip. And we hope there might be a way for parents or other family members to contribute towards a regular expense – such as the insurance payments on a car – and a way to split these payments easily.

The future will also see an extension of digital 'request to pay' capabilities for informal 'gig' services, like paying a babysitter, or payment on delivery of goods sold on platforms like Gumtree and Craigslist. With this kind of functionality, 'cash on delivery' will become a thing of the past, displaced by a solution that offers complete certainty, security, immediacy, and traceability.

Payments will blend into the background: intuitively, intelligently. They'll become less about technology, and more about enabling our lifestyles.

“Request to pay is an important innovation – it gives the user the ability to send out a digital invoice and embed a 'click' function to initiate payment for service or product.”

CHAPTER 2

Just-in-time business

In the frictionless future, payments are made in real-time, just-in-time, or on-demand. Automated payments smooth supply chains, creating agile businesses that grow faster.

"In a world where people are going online for buying and selling, the idea that a business can wait three days for a payment to clear is irrational."

Stephen Grainger, Executive Vice President for Business Partnerships

Richer data will smooth payment and procurement processes, helping businesses optimise their working capital.



Smoothing the supply chain

There have been great improvements and innovations in the way consumers pay, but the global business-to-business (B2B) payments space remains highly inefficient. Nearly half of all global B2B transactions – an estimated \$58 trillion – are still done in paper form.

Rich messaging functionality can help to accelerate the digitisation of business payments by facilitating the transmission of non-payment data. This data can be used to aid reconciliation, straight-through-processing, and the exchange of other business information to meet compliance with 'know your customer' and other regulation.


Digitising and simplifying supply chain-related processes will ease global trading operations across industries, but cooperation and collaboration will be necessary to create an ecosystem that is fully interoperable.

Elsewhere, increasing automation in the world of supply-chain logistics and materials handling will create enormous opportunities when it comes to making the flow of goods safer

and more efficient. Using the Internet of Things or other technologies for tracking the movement of physical goods, we could see the introduction of automatic payment on delivery. A 'just-in-time' solution like this would help businesses free up their liquidity.

And supply-chain financing can ease other frictions in business payments, most notably for open account transactions: At 15 percent annual growth, the supply-chain financing market is expected to reach \$7 trillion by 2023, including significant cross-border flows. Embedding rich data sets in every transaction as part of a 'request for finance' message will enable better, faster decisions to facilitate instant access to funds. It will help to reduce the working capital requirements of corporates, and represents a huge opportunity to widen access to financing for smaller businesses that have typically been excluded.

Of course, solutions like these depend on the availability of real-time payment systems – in 10 to 15 years, we expect instant payments to be ubiquitous.

A skateboarder in a white patterned shirt and dark pants is captured mid-air, performing a trick. The skateboard is visible below their feet. In the background, other people are seen at a skate park, including a person in a pink tank top and another on a skateboard. The scene is set outdoors on a concrete surface.

"The benefits of modernised payment systems aren't limited to faster speeds — it's also about the size of the data and the richness of messaging."

Andrew Buckley, Executive Vice President for Product

Merchants and service providers will be able to access their funds immediately, allowing their businesses to grow.



Powering small business

Small and micro-businesses are the growth engines of our economy; their importance to developed and developing economies is indisputable, but they suffer considerable cash-flow challenges. Businesses often wait up to a week for funds to be disbursed via traditional methods, plus an extra two to three days for funds to settle.

Instant settlement allow merchants to access funds from the sale of goods and services at the end of each day, or after every sale. It will significantly improve liquidity and cash flow for merchants, meaning they can pay suppliers, staff and overheads immediately – helping to swing the pendulum of success in their favour.

With the increasing speed at which rapid settlement solutions allows small merchants to access their funds, we're already seeing many small merchants move to card-only businesses.

"There's no doubt that real-time will become the de-facto standard for most payment systems around the world. It will be a key enabler for business growth."

George Evers, Senior Vice President for Real-time Product



There'll be a new wage system – one that enables choice and flexibility for the next generation of workers.

Fuelling the gig economy

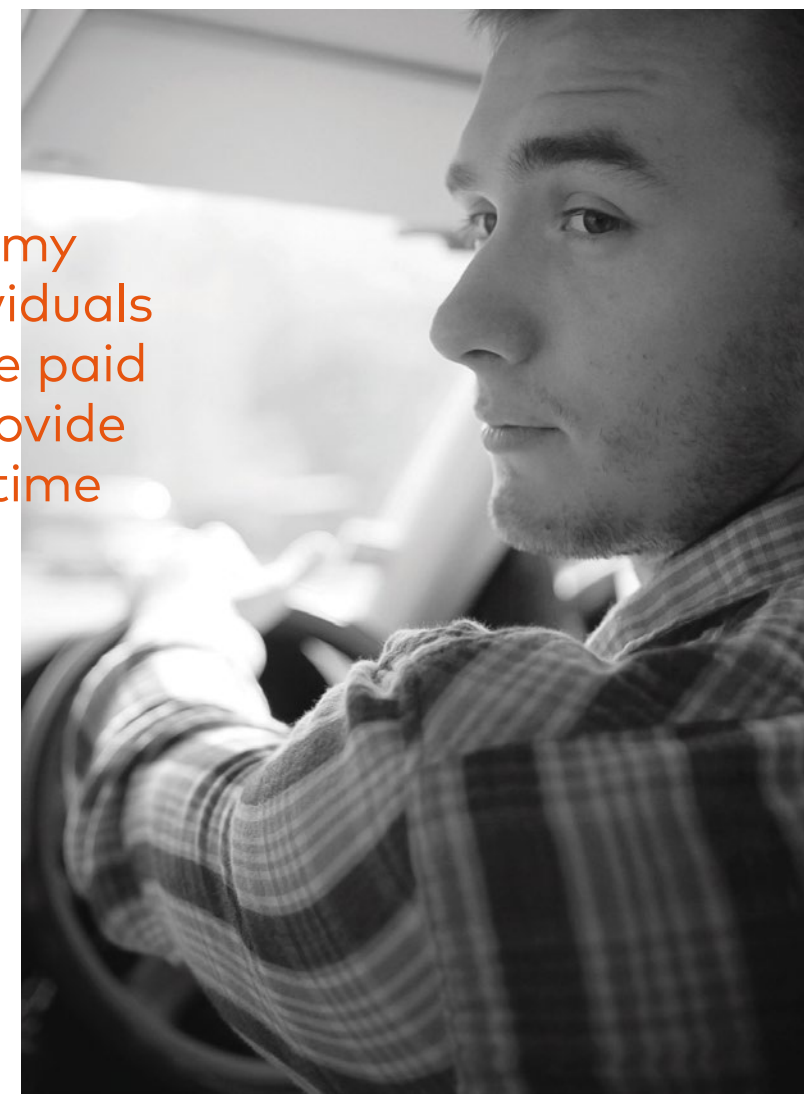
As the gig economy races forward, it is bringing with it a worker revolution. Freelancers now account for a larger portion of the global employment market than ever before, and their numbers are expected to grow at an average rate of 13 percent year-on-year to around 915 million by 2023.

Projections show demand will outstrip the supply of freelancers in five years, and gig platforms will be challenged to attract and retain freelancers to keep pace. Instant pay-outs are transitioning from being a 'nice-to-have' to a 'need-to-have', and gig workers increasingly favour platforms or employers that allow them to access their funds on demand.

Over time, these solutions will move upstream, blending flexibility with stability for those working without a traditional paycheque. As the monthly salary becomes the daily salary, it's likely the future will see accelerated payment on completion of work – by the hour or the minute.

Of course, immediate receipt of funds will also help to bring gig economy workers into the formal economy and provide gig platforms and governments with better insights into their workers' lives and experiences.

"The growth of the gig economy demands the ability for individuals and businesses to ask and be paid for the services that they provide in real-time. A modern real-time system supports this."



CHAPTER 3

Seamless cross-border trade

In the frictionless future, common standards and processes break down barriers to international trade. Global payments networks are secure, transparent and resilient — providing certainty in every payment.

"We can empower more people, businesses and governments to pay and get paid electronically in the way that best fits their needs."

Michael Miebach, Chief Product Officer

Making international payments will be as simple as making domestic ones.



An integrated global payments network

The uneven growth of domestic payment systems has resulted in fragmentation, and cross-border payments are rife with inefficiencies. We envisage a world where the traditional barriers of cross-border payments are broken down; where money flows seamlessly across borders in support of a global economy.

We don't think that cross-border payments challenges should be solved for with closed-loop systems: loops create barriers and friction; they reduce fungibility and portability; they limit competition and they fragment liquidity. The correspondent banking model is the only solution that's

genuinely ubiquitous: it can reach any country, any currency and any business or individual with a bank account.

In the next decade or so, efforts to evolve the correspondent banking model will make cross-border payments faster, certain and more transparent. We don't believe the future will bring a consolidation of payments systems, schemes or currencies. Rather, we expect to see something more along the lines of a federated global economy that preserves national autonomy and the integrity of domestic networks.

Ten to 15 years from now, ubiquitous real-time payments will accelerate payment delivery with 24/7 settlement and immediate access to funds 365 days a year. Real-time payments will make navigating a fluctuating foreign exchange easier and fairer for customers, businesses and non-governmental organisations.

Multi-rail network solutions will facilitate payments to and from any start point to any end point — whether that's a card, digital or bank account, or cash. We may even see the opening up of blockchain currencies as our definition of money — as a store of value — becomes increasingly agnostic.

“Our objective is to bolt together the currently disconnected real-time payments systems to enable transparent, fast, and reasonably-priced cross-border payments.”

Stephen Grainger, Executive Vice President
for Business Partnerships



Businesses will become increasingly border-agnostic, opening the door to global trade.

Business without borders

Supply chains are global; any company has multiple relationships with buyers or suppliers in countries outside its domiciled location. But business payments are highly complex: they require multiple data sets for a transaction to be approved.

ISO 20022 will be a fundamental enabler for seamless cross-border payments by allowing different schemes, currencies, and banks to speak the same language. It supports new payment messages, including 'request to pay' and 'request for finance', and non-payment messages that facilitate compliance and procurement processes.

Central to unlocking the potential of the ISO 20022 standard is widespread adoption, which is why we're engaging with payment schemes and governments to drive it to ubiquity. Common standards will mean international business payments and trade processes can gallop rather than trot, without compromising on security.

Distributed-ledger technology will likely bring additional value to the transfer of business information — it could even replace the likes of ISO 20022 to increase transparency among participants and further enhance businesses' back office efficiencies.

"There's no technical reason not to be able to send a payment to any person in any bank anywhere in the world."

Gregor Dobbie, Chief Executive Officer of Vocalink



Networks will be fully resilient, and cross-border transactions will be protected. Money will flow uninterrupted.

Network resilience

While it's full steam ahead for digital innovation, we have to remain thoughtful — any so-called 'improvement' that compromises the core stability of payments networks is a failure.

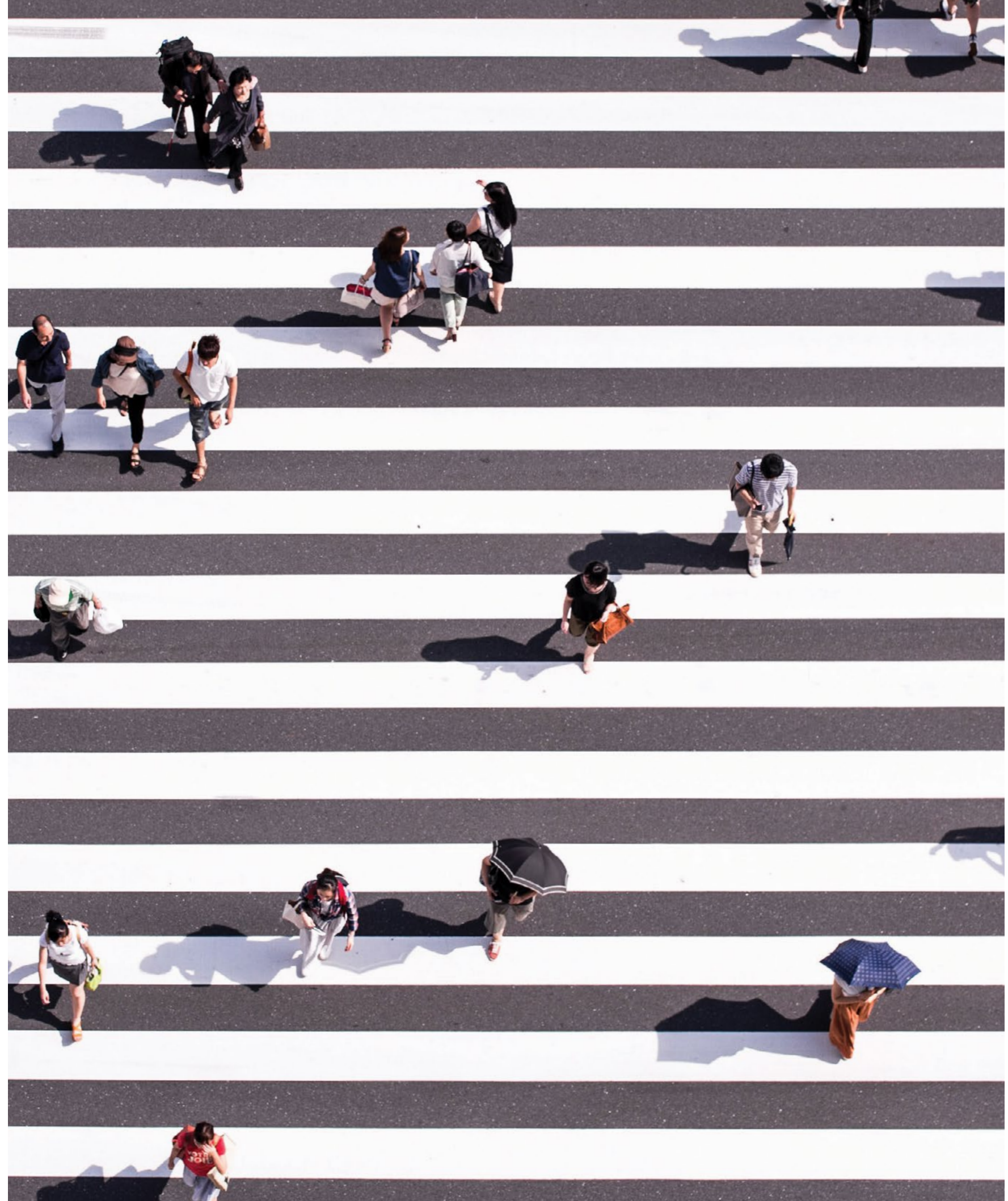
We invest a great deal of time and energy in developing resilience solutions that keep people and businesses transacting no matter what. Dynamic routing ensures there's no point of failure anywhere on the payments network, while rule-based stand-in processing guarantees the ability to pay and be paid anywhere and anytime. In future, we hope these will be part and parcel of every payment solution.

In a similar vein, the future must bring a solution for preventing payment fraud across multiple payment networks.

Of course, there are sensitivities associated with sharing payment and non-payment data beyond national borders, but a decentralised model might hold the answer.

We envisage a team of 'national fraud agents' that share information and insights into suspicious behaviours to mount a coordinated assault on financial criminals.

We'll have the ability to track bad actors that threaten people and businesses wherever in the world their money takes them.



"Global banks and businesses need to be able to transact 24/7/365... we need to make sure payment flows are uninterrupted."

Paul Stoddart, President of New Payment Platforms

CHAPTER 4

Inclusive access

In the frictionless future, digital technologies reach the parts of the world banks can't, empowering individuals and businesses. They level the playing field for competition and innovation, helping ecosystems to flourish.

"Smaller players... will have more control over what their destiny looks like."

David Daniel, Senior Vice President for Marketing & Communications

Levelling the playing field

The payment ecosystem is becoming more complex. Efforts to stimulate innovation and competition in financial services, which include regional and domestic Open Banking initiatives, are coming to fruition with the entry of challenger banks and alternative service providers — which include likes of Google, Facebook and other 'big-techs' — in the payments space.

By collaborating rather than competing with alternative service providers, financial institutions can leverage the vast amounts of data at their disposal to secure and expand their positions within the value chain — whether front, middle or back — while dynamically

integrating offerings from other players. It presents an opportunity for banks to expand into adjacent industries — such as retail, travel and health — completing the circle of the digital economy.

It's no wonder that in many places outside Europe, the industry is driving Open Banking initiatives: In the US, a number of large banks are striking data-sharing deals with individual partners; in Nigeria, the industry is cooperating on Open Banking standards.

Open Banking will continue to revolutionise the global financial ecosystem, creating new ways to partner, operating models

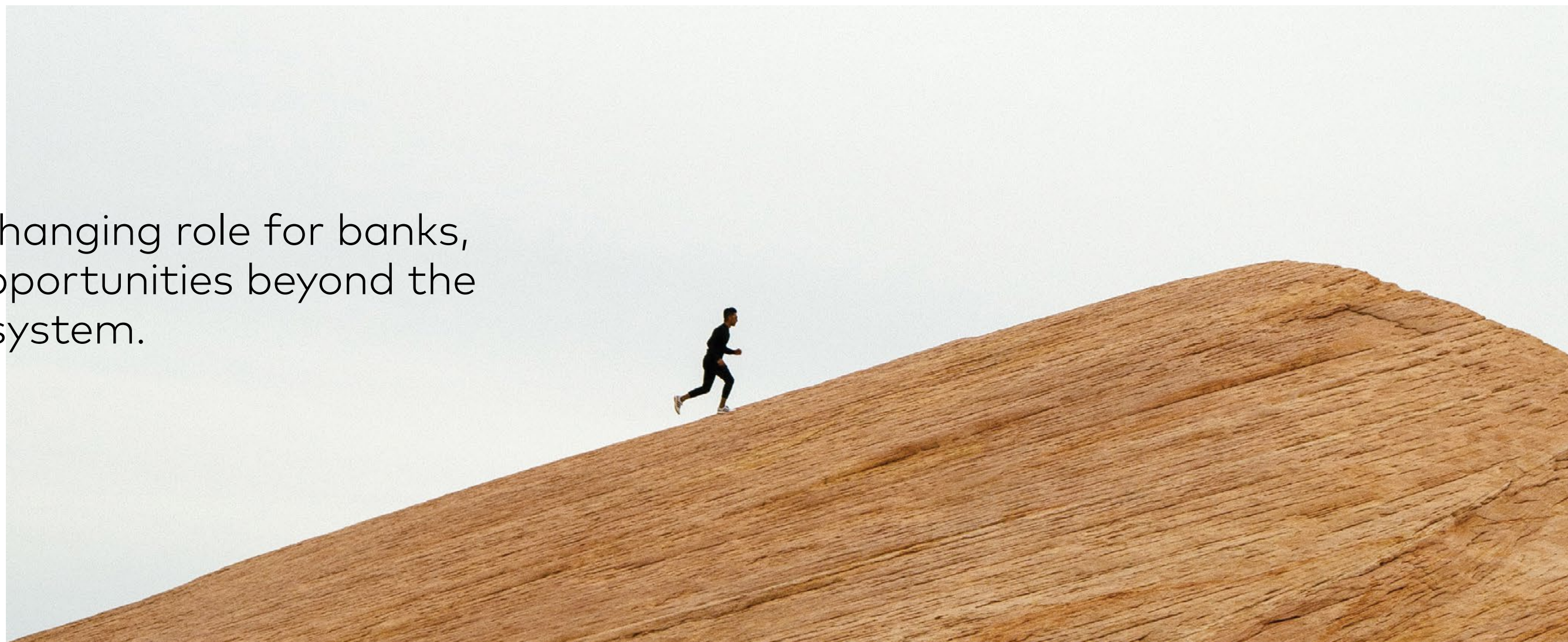
and service propositions. Everything will be accessible via an API, and bank accounts will be aggregated, which could result in a standardisation and commoditisation of basic banking services.

Those that innovate will thrive. PSD2 and other Open Banking initiatives are a golden opportunity for retail banks to re-imagine their products and services, and ensure they are fit for purpose in tomorrow's digital landscape. Within this new reality, we expect to see a shift towards consumer experiences facilitated rather than orchestrated by finance; with banks playing a deeper role in consumers' digital lives.

"Open Banking should be encouraged and enabled as it's empowering customers by giving them even more control over their data — and unlocking a wealth of services that can benefit them."

Jim Wadsworth, Senior Vice President for Open Banking

There'll be a changing role for banks, opening up opportunities beyond the payment ecosystem.



Technology will extend access to banking services for unbanked, underbanked and 'unhappily-banked' populations.



Reaching the parts of the world banks can't

An estimated 1.7 billion adults globally outside remain outside the financial system, but digital payments technologies can reach the parts of the world banks can't. Thanks to a phenomenon known as leapfrogging, where developing countries bypass rungs on the traditional development ladder, mobile money has become a key feature of the African financial services landscape.

The successful adoption of solutions like these depends on them being fit for the context in which they're going to be used. Reducing barriers to entry often means making technological compromises, but it creates a solution that is more serviceable to the customer.

With the continued rise of online and mobile banking technologies, we'll ultimately see an end to the bank branch as we know it. We envisage something like a Carphone Warehouse model for banks, which provides agnostic banking services.

For now, financial advisors are people; in future they'll likely be artificial intelligences or physical robots with which customers can interact. The advantage of this is that AI is more able to provide tailored advice, products and services more quickly to aid people's management of their individual finances. We'll likely see these capabilities deployed to mobile apps, providing financial advice in your pocket.

"In Kenya, Bangladesh, India and Pakistan, mobile technology has been a huge facilitator and massive accelerator for payments and payment-related tech."

Ian Gausden, Executive Vice President for Specialist Sales

We'll accelerate financial inclusion and equality across society, so that no one gets left behind.

Driving a new era of financial inclusion

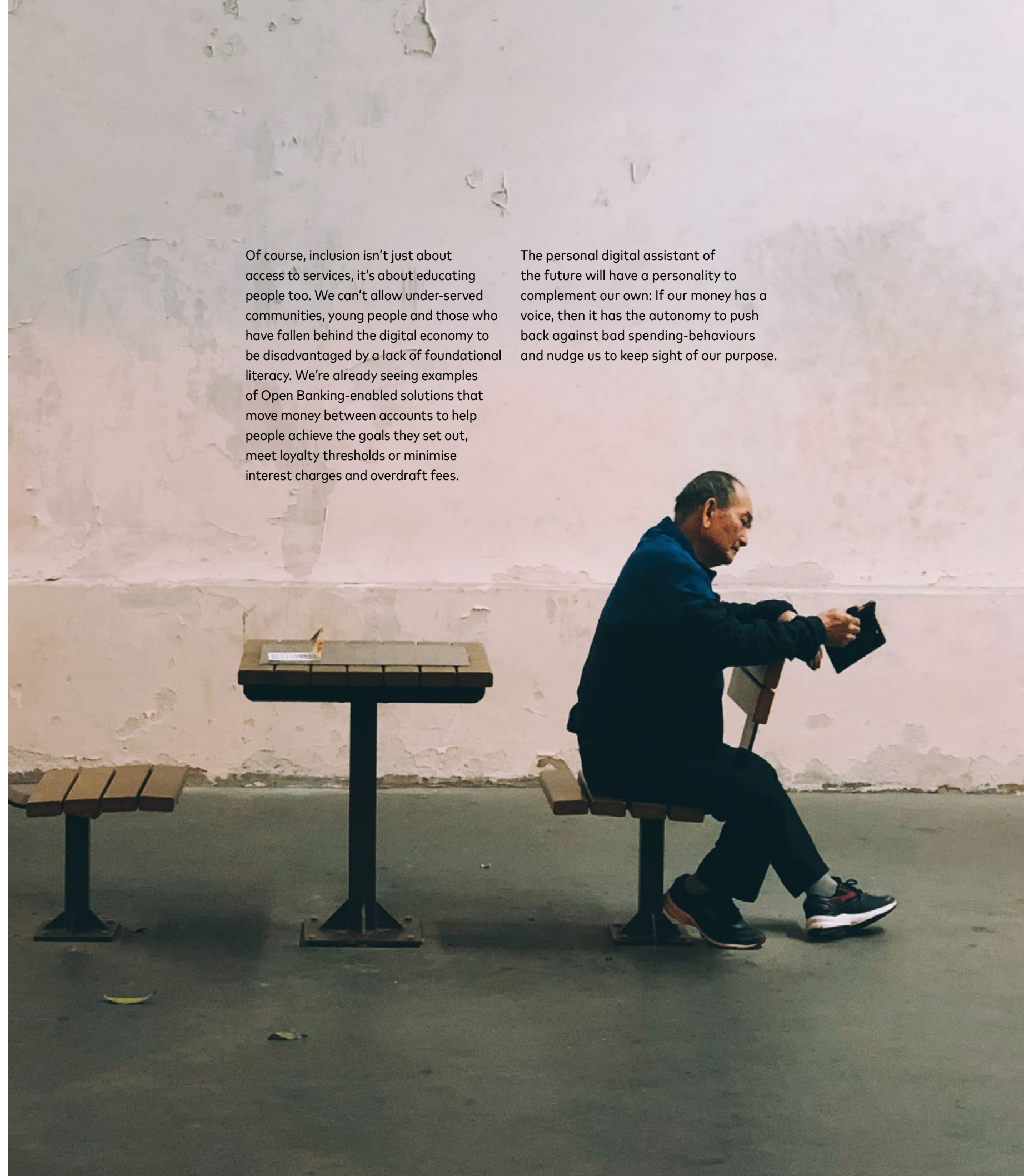
Modern developed economies are highly optimised for electronic payments, but this has its challenges: individuals who are unbanked incur what is commonly known as a 'poverty premium' for goods and services. We hope the future widens access to digital payment solutions to every individual.

Real-time payments have a significant role to play: Instant payments support inclusion by providing trust – they're irrevocable, and they mean funds are immediately available to spend, so both parties have confidence in the transaction even if they don't know the person they're transacting with.

For consumers, we'll see wider access to loans at "the moment of truth" – such as at checkout or elsewhere within the shopping value chain. For people who have 'thin files', eligibility might be determined by monitoring their buying habits and social circles as well as their credit records. The credit finance proposition will mature for businesses too: Bringing together banking and credit data can help lenders determine a business owner's eligibility for finance in the event they can't easily demonstrate their credit history.

Of course, inclusion isn't just about access to services, it's about educating people too. We can't allow under-served communities, young people and those who have fallen behind the digital economy to be disadvantaged by a lack of foundational literacy. We're already seeing examples of Open Banking-enabled solutions that move money between accounts to help people achieve the goals they set out, meet loyalty thresholds or minimise interest charges and overdraft fees.

The personal digital assistant of the future will have a personality to complement our own: If our money has a voice, then it has the autonomy to push back against bad spending-behaviours and nudge us to keep sight of our purpose.



"It's about striking a balance between a fully digital economy while also being inclusive for those on the margins."

Gregor Dobbie, Chief Executive Officer of Vocalink



CHAPTER 5

Combating financial crime

In the frictionless future, advanced authentication solutions give people control over their money and data. Intelligent algorithms prevent payment fraud before it occurs; we're closing the net on the bad guys.

"People are looking for security and trust."

Sandeep Malhotra, Senior Vice President for ACH Payments

Artificially intelligent 'guardian angels' will preserve the safety and integrity of payment systems, helping us stay one step ahead.



"Picking up on financial crime is difficult to do. But when you apply machine learning and predictive technology, it's possible to monitor behaviour on a real-time basis."

David Rich, Executive Vice President for Services

Exposing fraudsters

Artificial intelligence has proven itself critical in managing the complexities of today's evolving world. Bringing together card and account-to-account data to provide a network-level view of activity across payments networks, and overlaying machine learning techniques, can provide a substantial lift in fraud detection compared to legacy rules-based systems.

Of course, sometimes accounts are compromised in an event known as an 'account takeover'. This is where behavioural profiling technologies shine. Calibrated using high volumes of payments data, they can identify anomalous payment requests and alert financial institutions to act appropriately, while

reducing the false positives that can be so detrimental to the customer experience. We expect to see a significant increase in these types of solutions in future.

However, for all their incredible intelligence, where these solutions fall short is when payments are misdirected as a result of human error. Loss of funds by these means is considered the individual's problem, not the bank's, and if that payment is made via a real-time payment system it's irrevocable — there's little to no chance of reimbursement. But running a test to verify that the account a person is paying to actually belongs to the intended recipient could completely eliminate these errors — as well as incidents of push payment fraud.

In future, similar solutions could be used to detect suspicious activities beyond payments, such as identity theft and other forms of fraud. Increased use of request-for-information messages, for example, will allow payers to validate the authenticity of payees before sending payments. In the case of government agencies paying benefits, tax rebates or pensions, this will reduce handling and processing time and cost and help to eliminate so-called payment ghosts, where benefits and other disbursements continue to be made to recipients who have died.

See-everything networks will trace illicitly-obtained funds beyond borders, allowing for the repatriation of stolen funds.



Closing the net on the bad guys

The problem of money laundering is not a new one. For years, people involved in organised crime have endeavoured to set up bank accounts for the express purpose of moving the proceeds of crime through multiple accounts to obscure their source, fund criminal activities and extract funds, either wholly or in part.

Our analysis today looks at multiple factors, including behaviours, environments and relationships with suspect or known mule accounts. The massive volumes of data in our set allows us to distinguish normal behaviour from strange behaviour, such as sending money to a new account or splitting money into small equal payments. If a pattern of suspicious behaviour is detected, we

build a dispersion tree to visualise the movement of funds which, depending on the type of activity or scam.

The more patterns we analyse, the better our solutions become, and that bodes well for the future: Once we see the motif forming, we'll be able to make predictions based on previous findings that allow us to suffocate fund dispersion routes before the pattern is completed.

And, where solutions like these were once bound by the walls of an individual financial institutions, in future we'll be able to trace mule networks across payment networks anywhere in the world. With a global, see-everything network, money launderers may run,

but they won't be able to hide. A global, see-everything network will also support the industry with fund repatriation, subject to local market legislation.

In the future, money-laundering solutions will advance to the forefront of the payment experience, helping to prevent payment fraud before it occurs. We're already providing the capability to endow all payment initiation solutions with mule check, arming people with a first line of defence against financial crime.

Of course, these technologies are self-learning and will continue to reinforce effective decision-making via a positive feedback loop. Ultimately, it will come down to a battle of the artificial intelligences.

"A fragmented market creates blind spots where money laundering goes unchecked. The more joined-up thinking we can do, the better."



Advanced security and authentication

From 'swipe and sign' to 'chip and PIN', the evolution of authentication solutions has improved security and delivered greater convenience at the point of sale. Now, with the growth of mobile wallets, authentication methods are evolving again. Thanks to smartphone technologies, people are becoming familiar with and trusting of biometric authentication – typically fingerprint and facial recognition – for payments of any value.

In future, we'll see the introduction of authentication using other biometric identifiers, such as voice recognition or body language (including body posture, gestures and eye movements) at the point of sale. In e-commerce transactions, where analysis of physical attributes can be impractical, a potential solution could be verification by keystroke dynamics: the pressure a person exerts on the keypad when they type their password, or their typing speed.


Other solutions might be heuristic: verifying a person's identity based on previous and habitual activity. But the last thing we want to do is introduce layers of complexity to authentication: it will be seamlessly integrated with the shopping experience so that we barely notice it.

The future will also bring advances in security to give people peace of mind. Tokenisation as standard – the process of substituting sensitive payment data with a non-sensitive equivalent that has no extrinsic or exploitable value – will help combat the rise of payment fraud both in store and online by protecting customer account information.

Of course, these technologies aren't restricted to the world of payments. The future is driving towards a point where each person has a single, internationally recognised form of identification that proves who they are and what entitlement – or credit – they have rights to.

Ten to 15 years from now, we should all have understood that our role is not to enable a 'Big Brother' state, but rather to create a state where the individual has complete ownership of their digital and other identities. A lot of work needs to be done around data protection and how we control who sees what, but key players are already approaching those questions thoughtfully with logic-driven rather than technology-driven solutions.

It will be impossible to steal or imitate someone else's identity – our money and our credit will be an intrinsic part of who we are.

A close-up photograph of a person's eye. The eye is light-colored and has a vibrant rainbow reflection on its surface. Within the reflection, a person wearing a bicycle helmet is visible, suggesting a connection to cycling or outdoor activities. The background is dark and out of focus.

"The combination of national identification and pay will be the future."

Jim Wadsworth, Senior Vice President for Open Banking

Conclusion

Welcome to the frictionless future, where global economies and communities prosper.

"In the very near future, there will be no trade-off between speed and security. Commerce will be enabled by the simple, seamless and secure movement of money – for everyone, everywhere; using any device, or no device at all. The choices are endless."

Femi Odunuga, Senior Vice President for Digital Future

The pace of change is accelerating. Economies are developing faster, opening up more opportunities and connections across borders. New business models and services are blossoming, transforming the way we live, work and do business.

Many of the technologies required to enable the frictionless future of payments already exist. Our task now is to get those technologies in to the hands of the people and businesses that need them most. Many of the challenges are infrastructural, but others are behavioural; Driving advances will require collaboration between banks, governments and non-governmental organisations – and a great deal of creative thinking.

We expect to see greater diversity among the people who are driving change. Women, for example, will have a profound impact as they begin to hold more wealth and make more buying decisions.

The future also holds possibilities beyond payments. It will improve prospects, opportunities and safeguards for people in urbanised and rural communities, the largest and smallest businesses, and the most advanced and developing economies.

Some ideas will take time to mature, not reaching ubiquity for another few decades. But we're already delivering towards these outcomes and accelerating progress in new and exciting directions.

Will you join us on a journey to the frictionless future of payments?

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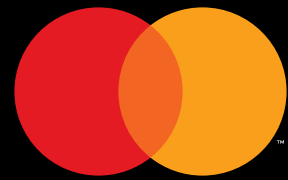
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Mastercard's global payments network connects consumers, financial institutions, merchants, governments and businesses in more than 210 countries and territories. For nearly 50 years, we've been using our technology and expertise to make payments safer, simpler and smarter.

Leveraging this network expertise, our account-to-account business provides domestic and cross-border solutions to create a future where money keeps pace with the way we live, work and do business: invisibly, intuitively, intelligently. Where people choose how they pay and get paid – securely and with certainty.

Together with our partners and customers we're improving world-wide connectivity in the account-to-account space, enabling choice and innovation across the digital ecosystem.



This is the frictionless future.

