OPEN BANKING READINESS INDEX:

THE FUTURE OF OPEN BANKING IN EUROPE

A 2021 REPORT

PAYMENTS INDUSTRY INTELLIGENCE
Payments
Cards & Mobile

Contents

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Foreword

Open banking is fast becoming a worldwide phenomenon. Whether regulator-driven or industry-led, it empowers consumers and businesses to take control of their financial data and their financial futures while stimulating competition and innovation among financial service providers. There are widespread benefits for all.

In the European Union (EU), the revised Payment Services Directive (PSD2) has been driving what we believe will bring a revolution in European retail banking. But 18 months since Open Banking regulation came into effect, market readiness varies across the region. Recognising the commonalities and differences between countries – their different strengths and weaknesses – is essential to help financial institutions, third party providers (TPP) and technology providers such as Mastercard make best use of the opportunity to lead our industry into its next generation.

Market readiness has resulting implications for the number and type of services that are becoming available across the region. Mastercard and its partners have been tracking the progress of open banking as a measure of the number and type of TPP by country every quarter since 2019. Our data shows that the UK continues to lead the way – not unexpectedly, given its domestic open banking initiative preceded that of the EU by more than a year – while western European markets follow most closely behind. Most providers are registered to deliver account information services, such as account aggregation and credit decisioning, while provision of payment initiation services lags behind.

Our annual research among consumers and small businesses, meanwhile, provides a barometer on attitudes toward the permissioned sharing of bank account data and the types of services people are most interested in. Appetite for payment initiation services is growing across the region as a means to make the experience of paying bills, sending money to other people and making online purchases more seamless and secure. We are excited to see how the market responds.

Elsewhere around the world, we are seeing a mix of approaches that all suggest open banking is set to become globally ubiquitous. At the time of publication, 36 countries and the EU are now host to open banking initiatives, with PSD2 serving as either a blueprint or inspiration. The insights from Europe that follow in this report are sure to prove useful to regulators and market participants alike.

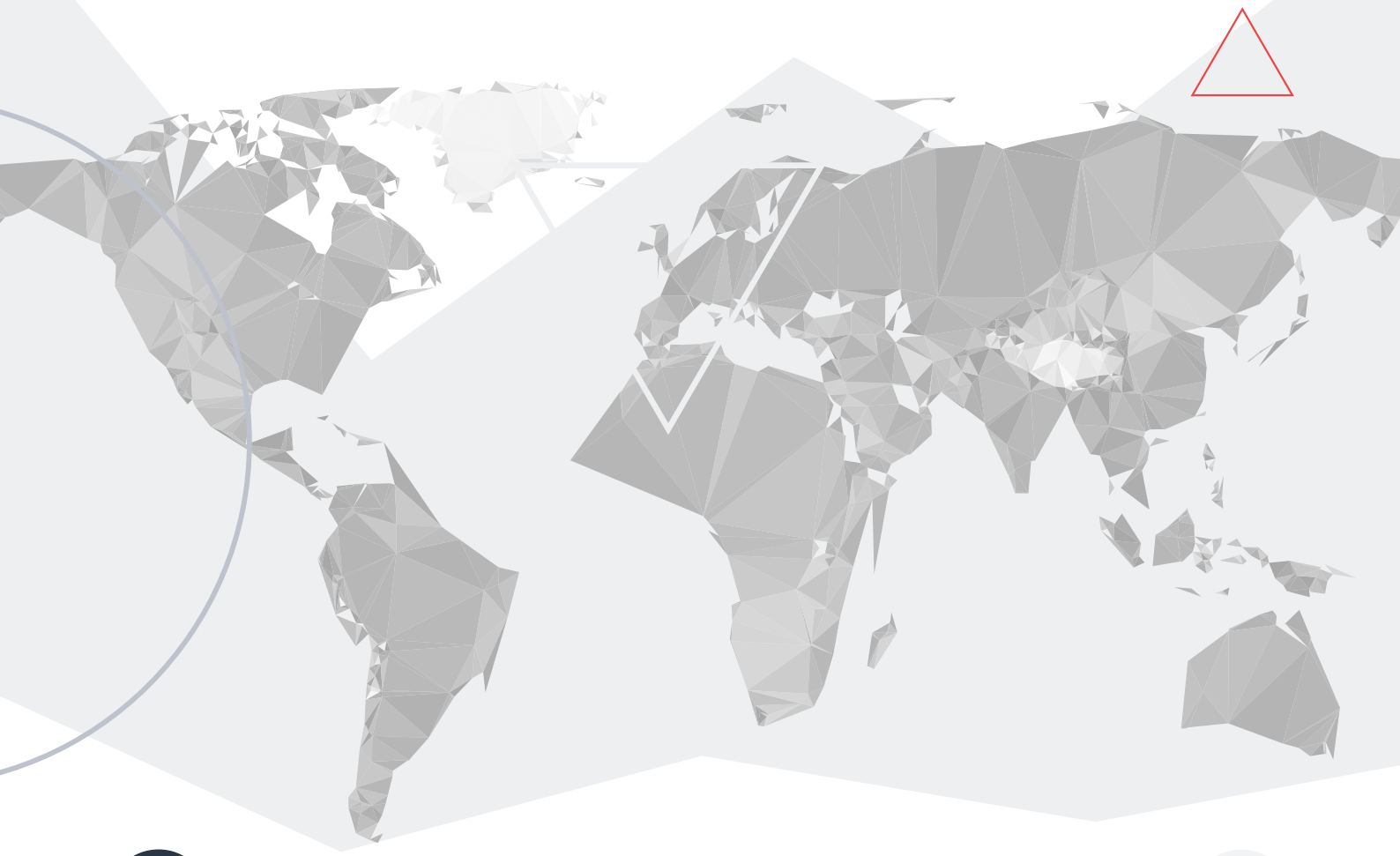
At Mastercard, we continue to support the development of safe and inclusive open banking ecosystems to benefit consumers and businesses across the globe. That's why we've developed a suite of Open Banking Solutions to enable connectivity and protection for financial institutions and TPP in Europe and beyond.

Visit **openbanking.mastercard.com** to learn more.

Jim Wadsworth

Jim Wadsworth

Senior Vice President for Open Banking, Mastercard



Open Banking is fast becoming a worldwide phenomenon.

Introduction

Open Banking first went live in 2018 in the UK as a means of allowing secure access to and control of consumer banking and financial accounts through third-party service applications. This new approach has the potential to reshape the competitive landscape and consumer experience in the banking industry.

In 2018, the adoption of the revised payment services directive, PSD2, set the stage for Open Banking across Europe. Coming into force in September 2019, PSD2's Open Banking mandate provides open access to customer payment accounts. From a legal perspective, PSD2's framework enables Open Banking by permitting bank clients and businesses to use third-party service providers to manage their finances.

In practice, Open Banking in Europe uses Open API technology to enable third-party service providers and banks to build new customer centric financial applications and services. At the same time, bank clients have made their smartphones the centerpiece of modern living and digital banking, which challenges European banks to focus on improving the bank client's digital experience.

Three years post UK go-live in early 2018, and 18 months after the Open Banking provisions of PSD2 came into force, Open Banking is playing a significant role in stimulating innovation in financial services, implementing immediate payment services, and launching digital payment service schemes enabling payments directly from bank accounts.

Across the continent, all European countries are now home to either regulator-driven or industry-led open banking initiatives and new digital payment service schemes which extend digital banking services to merchants and P2P money transfers.

However, European countries have each forged their own path to the implementation of Open Banking. This report compares selected European markets in terms of their regulatory readiness adopting the PSD2, their Open Banking API readiness, the digital infrastructure readiness, and notable Open Banking innovation.

OBJECTIVE OF THE REPORT

The objective of this report is to provide an Open Banking readiness status for ten selected European countries in March 2021. Our report:

- describes common elements between these different approaches at a country level
- highlights the differences between Open Banking implementations at a country level
- identifies the more advanced regulatory regimes with regard to Open Banking
- assesses Open Banking readiness at a country level
- outlines notable account-to-account (A2A) payment service scheme initiatives at a country level

Each of the brief country reports below provides insight into that country's individual Open Banking characteristics, the status of digital A2A payment schemes, and the country's Open Banking readiness in March 2021, including:

- overview characteristics
- digital banking Infrastructure readiness
- notable Open Banking details in the country
- Open Banking Readiness Index position
- selected case studies regarding successful digital payment service scheme initiatives

In particular, the report provides insight into the different individual approaches taken by ten European countries:

- **The UK –** a post-Brexit strategy to build a world-leading digital Open Banking ecosystem
- **France, Italy, Spain –** Open Banking as a vehicle for digital transformation of domestic payment ecosystems
- **Germany –** a collaborative German-specific approach to the development of Open Banking
- **Denmark, Norway, Sweden –** the Nordic collaborative models and the P27 initiative
- **Poland, Hungary –** Open Banking as a vehicle for leapfrogging away from legacy banking infrastructures

Open Banking in Europe

A Brief Introduction

The shift to open banking in Europe offers both banks and FinTechs new opportunities to create differentiation and generate new revenues.

Before the implementation of PSD2 and its Open Banking mandate, online and mobile banking in European countries focused on domestic banking services. Typically, European countries had high barriers to market entry for foreign banks and third-party FinTech businesses.

PSD2 lowered the barriers for market entry to third-party service providers and FinTechs, and opened the door for innovative players to offer services that did not exist such as account information services, third-party personal finance management, digital identity services, automatic onboarding and AML/KYC.

Open Banking can be characterised as a technology-driven evolution of the banking business leading to more transparency, customer choice and control over financial assets and personal data. Open Banking APIs are a key enabler of this evolution.

Open Banking has quickly evolved into a synonym for change in the banking industry which promises:

- banking services to banking clients and others through authorised TPPs
- greater financial transparency for account holders ranging from open data to private data.
- the use of Open Banking APIs that enable TPPs to build applications and services around the bank.
- the use of open-source technologies to achieve these objectives.

In parallel, mobile technologies and new consumer demands are rapidly transforming the financial services industry. Europe's consumers and businesses are embracing open banking, and this presents a challenge to the banking industry.

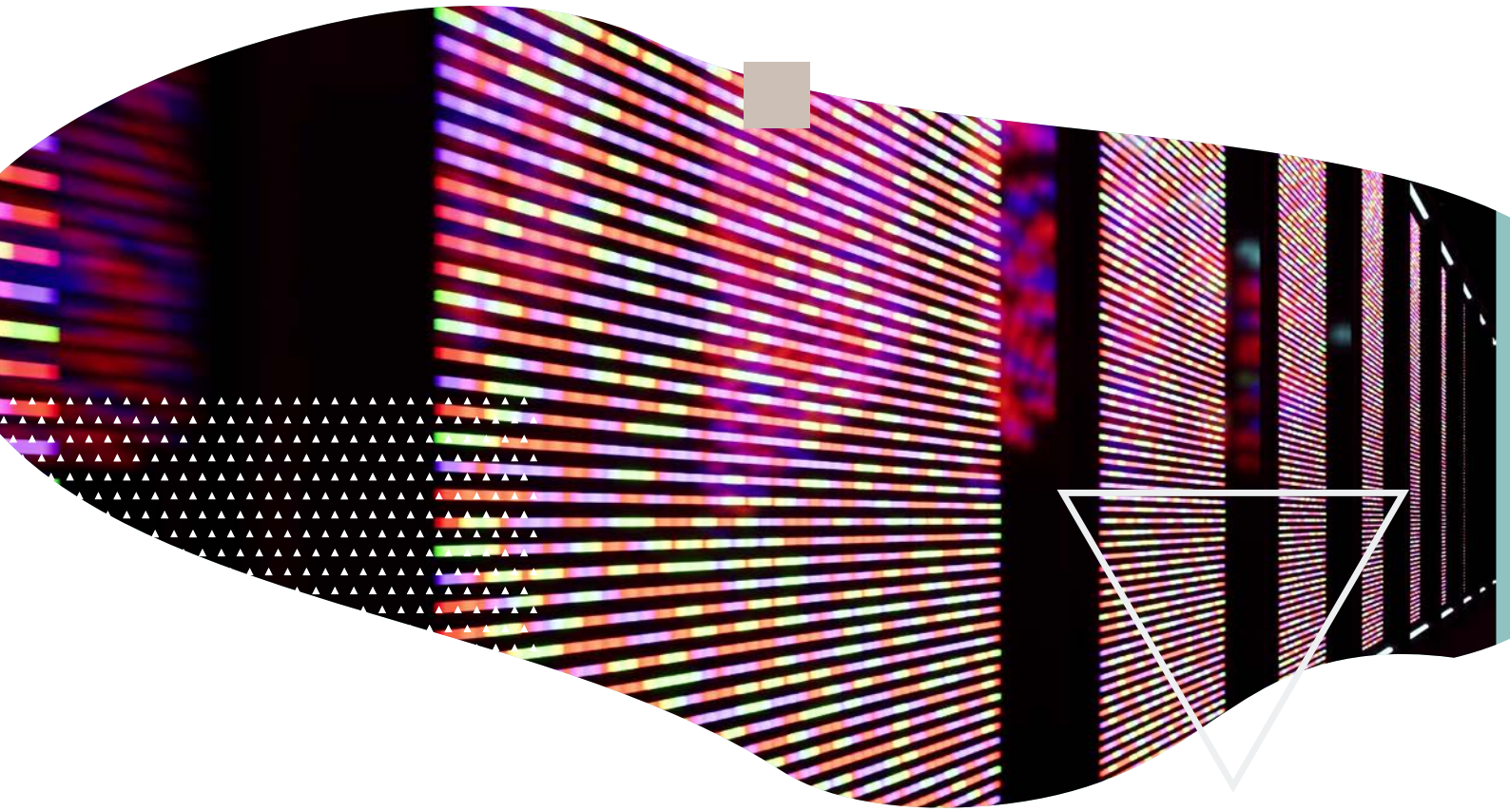
As bank clients are looking for Open Banking services to help them manage their finances, independent financial technology service providers (FinTechs) need standardised Open Banking APIs to get authorised access to customer account data and banking infrastructure.

In 2021, the Open Banking API landscape in Europe is rather fragmented. However, there are aggregators that provide universal connections to financial institutions' open banking functionality for third-party FinTechs. These aggregators possess scale, resilience and offer rapid speeds to market.

In addition, aggregators can provide near real-time verification of third-party's certificates, regulatory licence status and passporting permissions to support an account-holding ASPSP when deciding whether to accept a third-party's request.

Leading aggregators can provide a centralised enquiry and dispute resolution service to provide clarity, consistency and transparency for all participants in the Open Banking ecosystem.

Open Banking in Europe



THE REGULATORY FRAMEWORK

Europe has a unique legal framework for Open Banking which fully entered into force in September 2019.

PSD2 is key to the introduction of borderless digital banking and to the creation of digital payment services direct from bank accounts. PSD2 has formalised the relationship between European banks and competing independent FinTech service providers such as payment initiation service providers (PISPs) and account information service providers (AISPs).

Another significant regulatory trend is the implementation of the General Data Protection Regulation (GDPR) from May 2018. This established a regulatory framework for a customer's control of their data through consent mechanisms, the right to be forgotten and the right to retrieve all personal data for re-use at other service providers of choice, thereby preventing a 'lock-in' situation.

PSD2'S OPEN BANKING MANDATE

Open Banking's underlying concept is to increase the level of control available to bank clients regarding how, when and where they use banking services from their account-holding bank and TPPs. Open Banking allows them to access their account data across banks via a single app or by using an AISP app.

PSD2 mandates European banks to open their banking infrastructure via APIs to regulated TPPs. This allows TPPs to provide account information services and enable payment initiation services. PSD2 allows the sensitive data exchanged between TPPs and banks to be as minimal as possible. Payment instrument issuing PISPs may only receive a Yes/No answer from the consumer's bank about the availability of funds before initiating a payment.

In introducing the Open API concept for Open Banking, PSD2 has created a new set of regulatory technical standards (RTS) on strong customer authentication (SCA) and common secure access to bank accounts for TPP players. PSD2 mandates all banks to allow TPP access to bank client payment accounts for information and payment initiation services only if the bank client has explicitly granted permission to the TPP to initiate such a request, provided that the TPP has either a PISP license or an AISP license.

Subject to the adoption of the regulatory RTS on SCA and common secure access standard, Open Banking APIs are an effective and automated means of enabling appropriately licensed TPPs to connect to payment accounts in a secure manner, i.e. without compromising security standards and minimising the exposure of sensitive payment and account data.

THE OPEN BANKING PAYMENT ECOSYSTEM

The Open Banking payment ecosystem in Europe is comprised of account servicing payment service providers (ASPSPs), PISPs, AISPs, interbank organisations managing digital payment schemes, digital payment processors, aggregators and supporting digital payment technology suppliers.

In line with European regulators' borderless digital market strategy and PSD2's provisions, all key players in the payment industry must develop strategies fit for the digital economy. They are strategically investing in digital credit transfer payment services, immediate payments and disruptive digital technologies.

ACCOUNT SERVICING PAYMENT SERVICE PROVIDERS

All European banks serving retail clients offer online banking services and mobile banking apps to their clients. Most European banks now support SEPA credit transfers in SCT format and SEPA direct debits in SDD format. More than 56% of European banks support SEPA instant payments in SCT-Inst format.

In line with PSD2, European banks now act as ASPSPs. They work with independent TPPs such as PISPs and AISPs by offering a bank API set just to power their own bank business.

Additionally, European banks have actively started to cooperate with trusted Open Banking partners to create added value services which they market together. Open Banking partners may include consumer credit finance partners, personal finance management partners (PFMs), ETF broker advisors and other Open Finance innovators.

PAYMENT INITIATION SERVICE PROVIDERS

PISPs initiate non-card payments with the explicit permission of account holding customers. They typically play an intermediary role between consumers, businesses and merchants.

They establish a gateway between merchant's online shops and bank accounts of consumers and businesses. PISPs initiate IBAN-based digital payment services such as credit transfers and immediate payments.

According to PSD2's provisions, PISPs must have a PISP license granted by one of the European financial service authorities. Those with full banking licenses can also operate as a PISP, as can e-money institutions and payment institutions such as card acquirers if they extend their regulatory permissions.

ACCOUNT INFORMATION SERVICE PROVIDERS

AISPs provide payment account data for multiple banks with explicit permission from the account holder. They enable bank clients to have a global view of their payment data from accounts at multiple banks. Other valuable services include consumer credit, personal finance management and identity services.

For instance, AISPs can provide a single online portal and/or mobile app to consolidate different bank accounts the client may have with one or more banks and categorise the payment history. With an AISP service, the customer does not need to log into each bank's online banking platform separately. The client accesses information about all their accounts via a single AISP app.

According to PSD2, AISPs must have an AISP license granted by a European financial service authority. Those with full banking licenses can also operate as an AISP, as can e-money institutions and payment institutions such as card acquirers if they extend their regulatory permissions.

DIGITAL ACCOUNT-TO ACCOUNT PAYMENT SCHEMES

The SEPA End Date Regulation set a deadline to replace domestic credit transfer and direct debit schemes denominated in Euro by the respective SEPA payment instruments. From August 2014, all euro-denominated IBAN-based digital payment services in the euro countries are based on the following SEPA payment instruments:

- IBAN-based SEPA Credit Transfer in SCT format
- IBAN-based SEPA Direct Debit in SDD format – in a B2C variant and a B2B core variant
- IBAN-based SEPA Instant Payments in SCT-Inst format

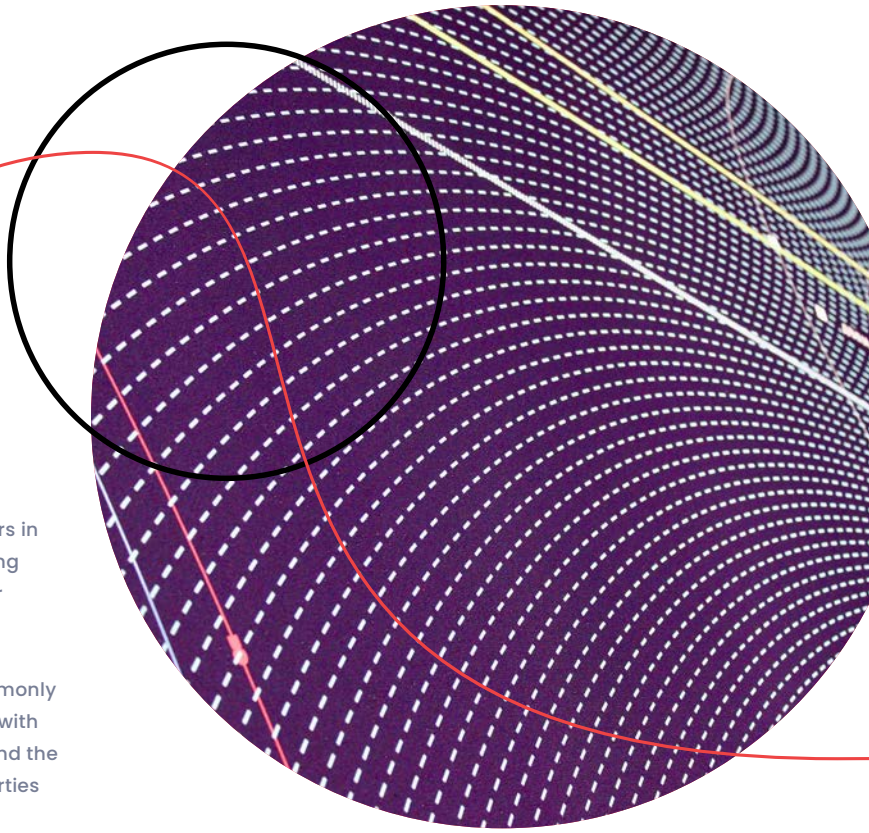
All European banks, interbank organisations and PISPs in the eurozone have migrated from domestic payment formats to these SEPA payment instruments. In Europe, there are more than 80 digital IBAN-based digital payment services. They are either domestic four-party models operated by an interbank organisation, mono-line services from large banks or independent three-party models from PISPs.

IBAN-based digital payment services in the euro countries are based on the SEPA payment instruments SCT, SDD and SCT-Inst. In countries with non-euro currencies such as the UK, four Nordic countries and the Central and Eastern European countries from Poland to Bulgaria, they are based on domestic payment instruments for credit transfers and immediate payments.

According to the European Payments Council (EPC), as of November 2020 as many as 3,990 payment service providers in 37 countries and territories offer IBAN-based credit transfer services, and as many as 3,186 payments service providers (PSPs) in 31 countries and territories have signed up to the SDD Core Scheme. Furthermore, by November 2020, 2,287 banks in 23 European countries had registered for the SCT-Inst scheme.

In all non-euro countries in Europe, many local banks support SEPA payment instruments in euros, and PISPs can initiate them. However, all non-euro countries have their own domestic payment schemes denominated in local currencies for domestic payments directly from bank accounts.

Open Banking in Europe



ABOUT OPEN BANKING APIs

The challenge for Open Banking and payment service providers in Europe is to connect around 4,000 ASPSPs with the fast-growing number of independent payment services providers and other potential Open Banking partners.

However, Application Programming Interfaces (APIs) are commonly used for sharing data and interconnecting platform solutions with trusted partners. Large companies such as Google, Amazon and the international card schemes offer their own API sets to third parties to login or to initiate messages, for example.

Open Banking API sets help European payment service providers to minimise the technical burden associated with connecting to around 4,000 ASPSPs in Europe.

The Open Banking API concept is also a big challenge from a security perspective. PSD2 mandates TPPs to identify themselves to ASPSPs to allow access to accounts and to communicate securely with the bank, the payer and the payee. The ASPSP needs to authenticate the payment service user. Financially sensitive transaction data must be securely exchanged and must not be accessible by any other party than the bank and the TPP, once the explicit permission of the account holding bank client has been obtained. Thus, all TPPs need to be correctly licensed as a PISP or AISP by a European financial services authority.

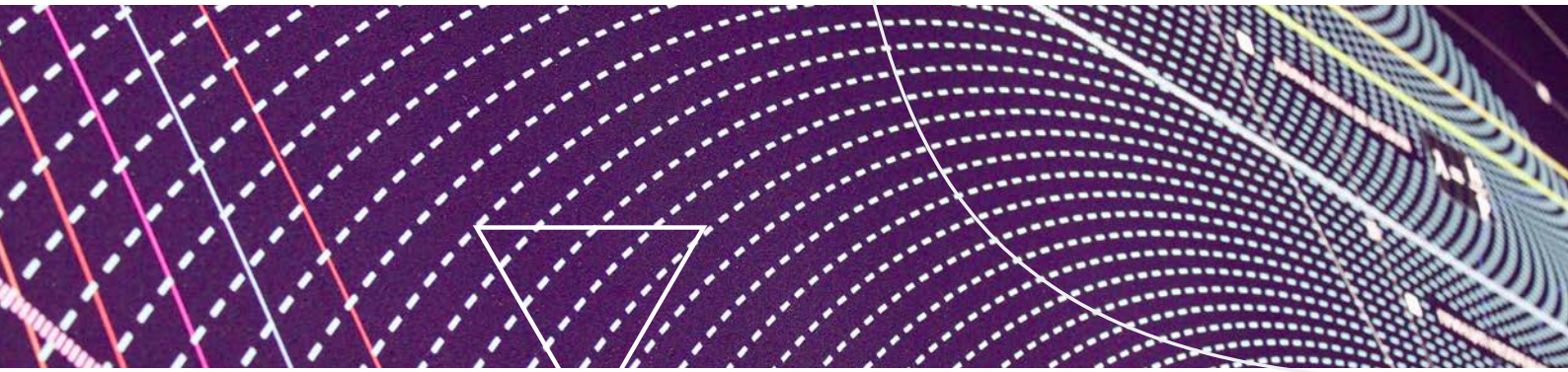
From an industry perspective, Open Banking challenges include the need for proper standardisation of APIs (beyond purely technical dimensions) and collective customer education about the new possibilities and how to behave securely when controlling financial assets and personal data with third parties.

Innovative European bank groups have been at the forefront of Open Banking APIs. Based on a clear Open Banking strategy, they have launched their own API interface sets for cooperation with TPPs. As early as mid-2017, more than 50 banks around the world said they had launched Open Banking APIs. In parallel, many independent FinTechs have developed their own API sets to connect individual banks with their services.

Open Banking API fragmentation: Three years post UK go-live in early 2018, and 18 months after the Open Banking provisions of PSD2, the Open Banking API landscape in Europe is rather fragmented with multiple standards and lots of bespoke APIs. In March 2021, the Open Banking API market can be characterised as follows:

- Most Open Banking API sets in Europe include secure interfaces, sandbox environments for testing purposes, documentation and support.
- If an individual bank or bank group has implemented its own API standard set or a domestic Open Banking API standard, TPPs must integrate with that Open Banking API set.
- Independent aggregators are providing universal connection to account holding banks' open banking functionality for third-party payment providers and FinTechs.
- In the UK, an Open Banking API set has been developed for use by the banks to ensure standardisation. The UK Competition and Markets Authority (CMA) found insufficient competition in British retail and SME banking, and proposed Open Banking as a solution. As a result, the banks were forced to fund a new organisation, the Open Banking Implementation Entity (OBIE).
- The European Union does not have universal government standardised APIs as in the UK. PSD2 regulation leaves the details of the APIs open, only the technical framework conditions are specified. In some markets, industry standards have evolved and are commonly used, other markets lack real standardisation.
- Based on industry initiatives, several Open Banking API standard sets developed at a domestic country level provide a harmonised API standard for accessing bank accounts in that country. Such notable Open Banking API standards include STET, PolishAPI, Swiss Corporate API and Berlin Group's NextGenPSD2 framework.

Open Banking in Europe



- Spain and Italy provide API access to the biggest share of all banks with consistent APIs thanks to outsourcing their requirement to a single bank serving aggregator in those countries. In Hungary, Open Banking API sets from foreign bank groups dominate.
- The Nordic countries mainly adapted the Berlin Group's Open Banking API framework, NextGenPSD2, and some bank cooperation has harmonised the implementation. Aiia along with Mastercard Payments Services offer aggregator services in the region.
- The high number of Open Banking API sets used across Europe indicates a fragmented Open Banking market.
- So far, single banks, large bank groups and independent FinTech service providers all prefer their own Open Banking API sets, but they choose to use a domestic Open Banking API standard. According to market insight, Berlin Group's NextGen PSD2 has a market share of around 40% followed by Open Banking UK (24%).
- Apart from the domestic Open Banking API standards (see above), there is currently no single pan-European Open Banking API standard. However, the Euro Retail Payment Board (ERPB) has extended its mandate to form the SEPA API Access Scheme, which aims to establish business requirements, governance arrangements and a standardised API interface. This work is set to commence in July 2021.

Exemption as a concept means that TPPs will typically be required to use a bank's dedicated Open Banking API set exclusively.

In the early stage of Open Banking implementation, however, European banks have offered connections through API sets and through proven Modified Customer Interfaces (MCIs) for their online banking portal as fallback. The main reason for using MCI fallbacks was that many so-called Compliance API sets have not been fully developed or might not yet work well enough to allow for exemption.

If a bank can prove its API set is reliable enough and well-functioning, however, it can apply for an exemption to offer just its API set to TPPs. In this case, the local financial services authority can grant an exemption allowing to phase-out MCI use.
In the second stage of Open Banking implementation, many European banks have already applied for and obtained an exemption allowing them to phase out the initial MCI fallback access for TPPs, replacing this with a dedicated Open Banking API set.

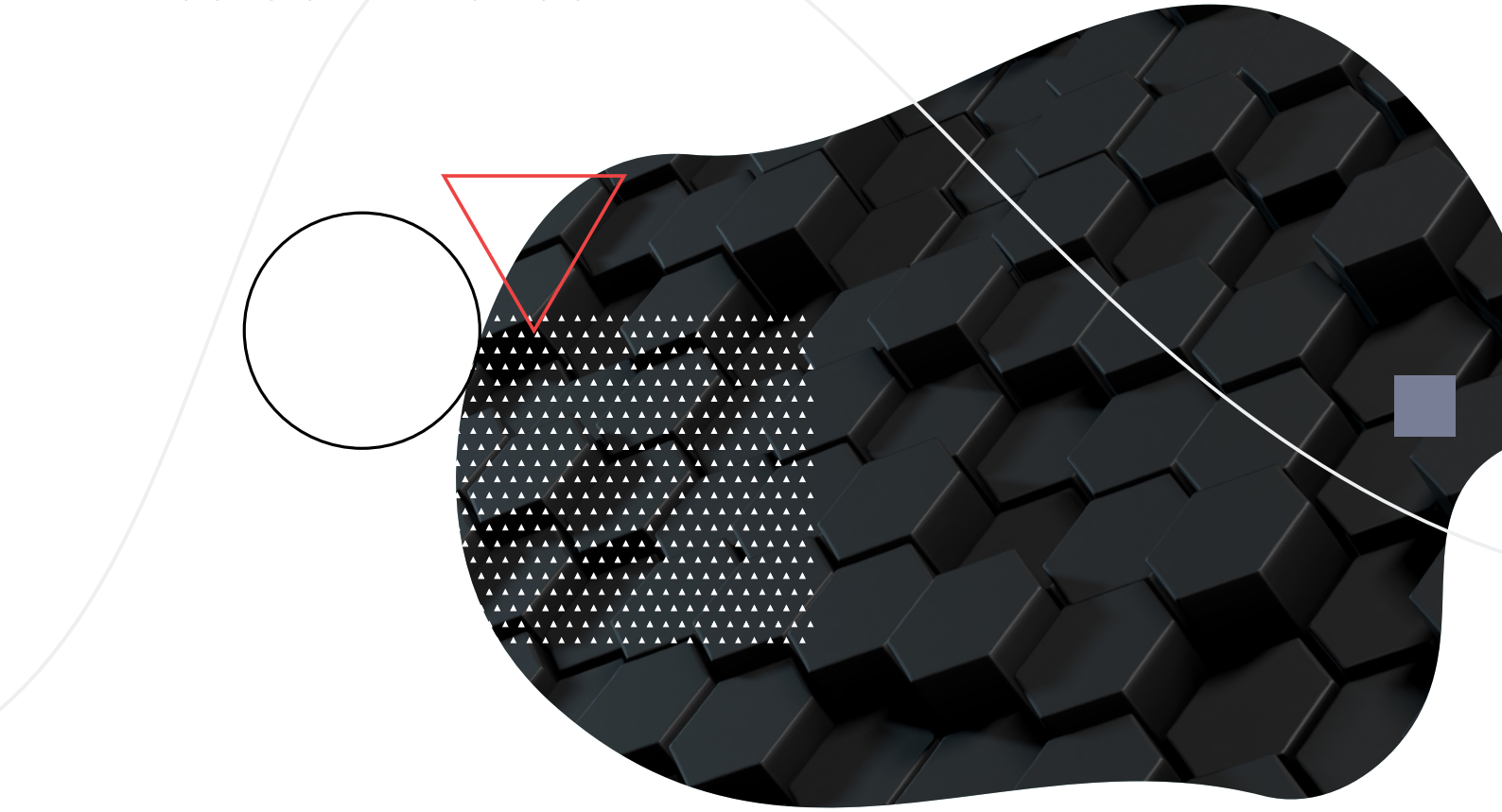
EXTENDING OPEN BANKING BEYOND PAYMENTS – THE ROAD TO OPEN FINANCE?

In December 2019, the UK Financial Conduct Authority (FCA) published a consultation paper which sought to explore the opportunities and risks that would arise from extending open banking principles to give consumers/businesses greater control over their financial data. The proposal looks beyond PSD2's sole focus on payments towards a data-sharing regime between incumbent service providers and TPPs which would be extended to cover savings, mortgages, consumer credit, investments, pensions and insurance.

According to UK Finance and the CMA9 banks, a new non-profit UK service company is expected to pave the way for the UK Open Banking model to be extended towards an Open Finance framework beyond payments.

As part of its Digital Finance Package, which the European Commission published on 24 September 2020, the Commission undertook to launch a comprehensive review of PSD2 by the end of 2021. The Commission has also pledged to present a legislative proposal on a new Open Finance framework by mid-2022.

In October 2020, the Berlin Group announced it will start work on a full Open Finance API framework. According to the Berlin Group, the Open Finance framework will add standardised extensions beyond the regulatory scope of PSD2 which allow banks and TPPs to offer enhanced services, leveraging the NextGenPSD2 API Framework technology and infrastructure investments. By expanding the access of customers' financial data to broader data sources and additional account types, enhanced views on customers' finances will empower bank customers to actively choose the best value products and services they need beyond payments.



AGGREGATORS CAN ACCELERATE API INTEGRATION

The Open Banking market is beginning to move from "Compliance APIs" towards "Commercial APIs", which are quicker to deploy and possess rich functionality with an enhanced user experience and indirect revenue options for account-holding banks.

According to market insight, API integration will break down boundaries. Therefore, one Open Banking challenge is to implement a scalable API integration strategy. By the end of 2020, around 90% of European financial services companies had an Open Banking API strategy, and 80% agreed that API integration is mission-critical to their Open Banking strategy.

CHALLENGE: OPEN BANKING API INTEGRATION

Apart from few domestic Open Banking API standards, there is currently no single pan-European Open Banking API standard.

European banks and independent TPPs are supported by around 20 Open Banking API aggregators in each country across Europe, potentially connecting more than 450 TPPs with more than 4,000 ASPSPs. This demonstrates a lack of Open Banking API standardisation and shows that the Open Banking API landscape in Europe is, to date, rather fragmented.

From an industry perspective, Open Banking challenges include the need for proper standardisation of APIs (beyond purely technical dimensions) and collective customer education on the new possibilities and secure behaviours when exercising control over financial assets and personal data in relation to third parties. In 2021, the Open Banking ecosystem faces the problem that the high number of Open Banking API sets are causing a fragmented Open Banking API market which risks killing the benefits of frictionless Open Banking.

In an Open Banking ecosystem, however, an effective robust API integration platform would provide a straightforward way to leverage both old and new applications by acting as an aggregating API integration platform.

AGGREGATORS – BRIDGING GATEWAYS AND API INTEGRATION

Generally, aggregators serve the needs of their clients such as TPPs and ASPSPs. They provide universal connection to financial institutions' open banking functionality for TPPs. Known as OBP processors, aggregators act as Open Banking API gateways, Open Banking platform processors and Banking-as-a-Service solution providers.

In 2021, all aggregators in Europe provide API integration, secure API interfaces and universal connections to European financial institutions' open banking functionality for TPPs with scale, resilience and speed to market.

Open Banking Readiness

Key Findings

Before implementing the revised payment service directive, PSD2, and its Open Banking mandate, European online and mobile banking focused on domestic banking services between domestic banking groups. In addition, European countries had high barriers to market entry for trusted third-party FinTech partners.

The adoption of PSD2 has set the stage for Open Banking in Europe. PSD2's Open Banking mandate has had a significant impact on the European financial services industry. After an initial phase of resistance, however, most European banks have embraced Open Banking.

PSD2's challenges for retail banks, digital challenger banks and other FinTechs include Open Banking, Open Banking APIs, and the rollout of Open Banking payment services alongside digital banking apps. Leading European bank groups are among Europe's front-runners in Open Banking.

The roll-out of Open Banking has gained momentum. For the ten countries researched in this report, please refer below to the brief country reports added after the Open Banking Readiness Index 2021.

INDIVIDUAL OPEN BANKING STRATEGIES BY MARKET

This Open Banking report compares selected European markets in terms of their readiness in terms of adopting PSD2, their API readiness and Open Banking payment innovation. In particular, the report provides insight into the different individual approaches taken by ten countries:

- **The UK –** a post-Brexit strategy to build a world-leading digital Open Banking ecosystem
- **France, Italy, Spain –** Open Banking as a vehicle for digital transformation in domestic payment ecosystems
- **Germany –** a collaborative approach, specific to Germany, to the development of Open Banking
- **Denmark, Norway, Sweden –** the Nordic collaborative models and P27 initiative
- **Poland, Hungary –** Open Banking as a vehicle for leapfrogging away from legacy banking infrastructures

From a pan-European perspective, the regional regulatory regimes in the Nordic countries seem to be slightly more advanced regarding Open Banking ecosystems and digital payment services than the domestic approaches of other countries (see case study Invidem below).

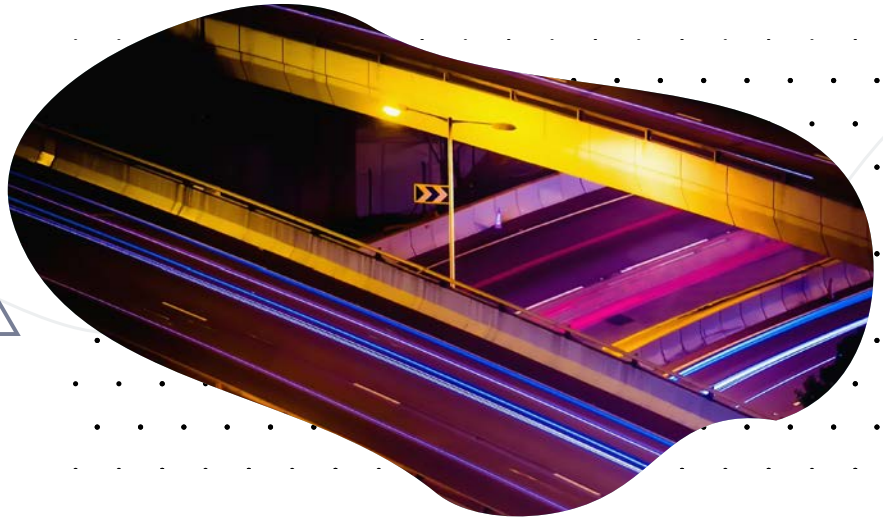
COMMON ELEMENTS IN COUNTRIES' APPROACHES TO OPEN BANKING

By taking advantage of pan-European developments such as PSD2, European banks are progressing towards a full Open Banking environment. Many banks have added on-demand account aggregation services and immediate payments to their online banking services and mobile banking apps. In addition, regulatory standards have been implemented, including RTS on SCA and common secure access and a growing number of banks are offering payment initiation services.

The advent of PSD2 opened doors for innovative players to offer services that did not previously exist, such as account information services between banks, third-party personal finance management, and digital ID/KYC services.

This report has identified basic common practices between individual country approaches by country.

Key Findings



- The legal framework for Open Banking is in place. All countries have transposed PSD2 into national law.
- Open Banking strategies fit for the digital economy are in place. Payment initiation and account aggregating information has been added to digital banking.
- Consistent with the provisions of PSD2, European banks act as ASPSPs and work with independent PISPs and AISPs using their own API sets.
- All European retail banks offer online banking services and mobile banking apps to their clients. An increasing number of banks integrate immediate payment services into their online banking services and mobile banking apps. Many mobile banking apps also offer mobile P2P money transfer services.
- Under PSD2's mandate, all European banks must make provision for account information and payment initiation services to their online banking services and mobile banking apps. Bank clients can use the account information statements and payment transaction histories from their other bank accounts, with information aggregated and categorised in real-time at each login. This enables clients to undertake personal financial management by themselves in a single app, or to take advantage of mobile apps from independent PFM service providers.
- European banks cooperate with select trusted FinTech partners to create added value services which they market together. These may include PISPs, AISPs, aggregators, consumer credit finance partners, personal finance management partners (PFMs), eID identity services and/or ETF broker advisors.
- Instant Payment Schemes or domestic immediate payment schemes are in place. Many European banks see instant payments as a key future technology for transforming their domestic payment services into digital payment services fit for the digital economy.

NOTABLE DIFFERENCES BETWEEN COUNTRIES

This report identifies some notable differences between individual country approaches:

- Nordic banks are pushing a regional approach with the intent of creating a pan-Nordic cross-border infrastructure, P27, and a Nordic KYC utility. The two case studies below show the Nordic collaborative models working to achieve a regional Open Banking infrastructure. This advanced approach differs from that of other European countries.
- UK banks and the UK regulator launched plans to extend the Open Banking UK model towards an Open Finance framework beyond payments.
- For the time being, German banks use the existing online banking standard FinTS between German banks and, in parallel, the Berlin Group's Open Banking API standard NextGenPSD2 for TPP access.
- There are different approaches towards the creation of Open Banking API standards:
  - A domestic Open Banking API standard is in place in the UK, France, Germany and Poland.
  - Spain and Italy provide API access to the most banks with consistent APIs by outsourcing their requirement to a single bank serving aggregator in those countries.
  - Banks in Denmark, Norway and Sweden provide Open Banking API access in combination with aggregators that provide connectivity between Nordic banks with each other and independent PISP/AISPs. This approach may be a basic step towards a potential future Nordic Open Banking API set as part of a Nordic cross-border payment infrastructure.
  - Open Banking API sets in Hungary are at a bank group level dominated by foreign bank groups.
- In several European countries, there are new bank-backed interbank organisations which operate domestic digital A2A payment service schemes as four-party models with the intent to add instant payments and mobile P2P payments to the service mix.
- There is variation in the maturity of domestic digital A2A payment service schemes.

DIGITAL INFRASTRUCTURE READINESS

The ongoing rollout of a mature online and mobile communication infrastructure in Europe will be an enabler for digital payment transformation and for Open Banking.

In 2019, 72% of internet users in the EU27+UK countries shopped online. The proportion of internet users ranged from 99% in Iceland and Norway to 83% in Italy and 72% in Bulgaria and in Turkey. The proportion of individuals using the internet for ordering goods or services in the last 12 months ranged from a high of 88% in the UK down to 46% in Italy and a low of 26% in Romania.

In 2019, the 4G LTE internet penetration rate in the 10 countries covered by this study ranged from 77% to 96%, with 5G internet at least partially available in 378 cities across 34 countries, 15 of which are in Europe, including Austria, Germany, Spain, Sweden and Switzerland.

Digital technologies and new consumer demands are game-changers. Europe's consumers are embracing mobile devices such as tablets, smartphones and others enabled with the Internet of Things (IoT). Looking into specific data from major European countries, we can see that connected consumers are the new normal for European banks.

At the end of 2020, digital infrastructure readiness has achieved a mature level (see Table 1).

- Internet access nearly a standard in each country with fast growing digital commerce
- Smartphone penetration in each country has achieved maturity
- There is widespread high penetration of 4G LTE internet and 5G internet launched in nine countries, as well as being planned for Poland
- Digital Banking use has achieved maturity, with fast growing mobile banking use. Only Italy, Poland and Hungary are a bit behind, with digital banking use lower than 60%.

TABLE 1 – DIGITAL INFRASTRUCTURE READINESS

DIGITAL COMMERCE READINESS	NO	DK	SE	UK	DE	FR	ES	IT	PL	HU
Households with internet access (%)	98%	95%	96%	96%	95%	90%	95%	86%	87%	87%
Last internet use (individuals, 12 months)	99%	97%	98%	99%	94%	91%	93%	83%	88%	90%
Internet users who bought online (%)	83%	87%	84%	88%	84%	77%	62%	46%	61%	54%
Last online purchase (individuals, 12 months)	82%	84%	82%	87%	79%	70%	58%	38%	54%	49%
Last online purchase (individuals, 3 months)	67%	74%	70%	80%	71%	58%	47%	28%	41%	35%
eGDP (as a % of 2019 GDP)	3.3%	6.4%	1.8%	7.9%	2.7%	4.3%	4.3%	1.8%	2.2%	1.1%
DIGITAL INFRASTRUCTURE READINESS	**NO**	**DK**	**SE**	**UK**	**DE**	**FR**	**ES**	**IT**	**PL**	**HU**
Mobile phone subscriptions per capita (%)	107.2%	125.5%	126.3%	118.4%	128.4%	110.6%	118.3%	133.1%	137.9%	106.1%
Smartphone penetration (% of mobile phones)	95.0%	88.0%	92.0%	82.9%	79.9%	77.5%	72.5%	60.8%	75.0%	73.9%
4G LTE internet penentration (%)	95.5%	88.6%	91.1%	91.1%	76.9%	79.7%	87.4%	79.0%	82.9%	91.4%
5G internet penentration (%)	launched	launched	launched	launched	launched	launched	76.0%	launched	planned	launched
Digital banking penetration (%)	95%	94%	85%	88%	65%	69%	62%	39%	49%	51%

Source: PCM research. Data collected Dec 2020 – May 2021

OPEN BANKING INFRASTRUCTURE READINESS

Three years post UK go-live in early 2018, and 18 months after the Open Banking provisions of PSD2, Open Banking infrastructure readiness by individual country had already reached maturity by the end of 2020 (see Table 2).

- The legal framework for Open Banking is in place. All countries have adopted PSD2 into national law.
- Payment initiation and account aggregating information has been added to digital banking.
- Instant Payment Schemes or domestic immediate payment schemes are in place. The euro countries use the SEPA payment instruments SCT, SDD and SCT-Inst, while non-euro countries have implemented their own credit transfer and instant payments schemes denominated in local currencies.
- As of 31 December 2020, 450 Open Banking licenses for TPPs were registered with a FSA in Europe, up ten percent since the end of October 2020. Half of them are licensed to provide both account information and payment initiation services.
- There are significant differences between the countries. Depending on the flexibility of domestic financial services regulation and bearing in mind the EU's passporting regime, 59.3 percent of all trusted TPPs have applied for UK licenses. However, this may change significantly post-Brexit.
- Apart from Hungary, nine countries have already opted for either a domestic Open Banking API standard or an aggregator-supported Open Banking API model.
- The high number of Open Banking API sets used across Europe indicates a fragmented Open Banking market.
- Individual country banks and TPPs in each country are supported by around 20 API aggregators, which can potentially connect more than 450 TPPs with more than 4,000 ASPSPs.

Apart from the fragmented Open Banking API market, the mature level of Open Banking infrastructure readiness in March 2021 shows that Open Banking implementation in Europe has already gained significant momentum.

TABLE 2 – OPEN BANKING INFRASTRUCTURE READINESS

INFRASTRUCTURE READINESS	NO	DK	SE	UK	DE	FR	ES	IT	PL	HU
Open Banking Regulation implemented	PSD2, GDPR implemented			PSD2, GDPR implemented						
Digital Payment Instruments used	domestic CT realtime			Paym, Faster Payments	SCT, SDD, SCT-Inst				Elixir Express Elixir	domstic CT AZUR
Open Banking licenses in country for PISPs	4	5	14	73	24	12	8	5	6	1
Open Banking licenses in country for AISPs	4	9	28	184	35	20	8	8	10	5
Open Banking licenses in country for TPPs	6	13	31	200	35	23	8	9	12	5
TPPs passported in country	93	102	105	67	112	115	115	118	108	90
API Aggregators in country	19	20	19	22	20	19	20	19	19	17
Open APIs active in country	194	53	44	166	68	89	46	53	46	34
Open API Standard in country	Nordic API			OBIE	FinTS, NextPSD2	STET	outsourced to one aggregator		PolishAPI	by bank

Note: TPPs can be either an AISP, a PISP, or both AISP+PISP. Around 4,000 ASPSPs offering AIS/PIS services under PSD2 regulation are not counted here.

Note: the Nordic banks have started a process of developing a so-called Nordic API set for the Nordic region.

Source: European Banking Authority, domestic FSAs, PCM research. Data collected Dec 2020 - May 2021

Note: Numerous individual savings banks, cooperative banks, mutual banks and individual branches of bank groups are not counted as one individual ASPSP because they are de-facto served by a single banking processor at a group level.

For example, all 380 savings banks and 844 cooperative banks in Germany offer account aggregating services in-house. As they are serviced by their banking processors at bank sector level, they are counted as two ASPSPs in this report.

DIGITAL PAYMENT READINESS

Table 3 shows those countries in which large local banks have launched digital payment apps to enable payments directly from account, and which countries have launched such services at a domestic country level. The digital payment readiness by individual country shows individual strategies and different levels of maturity at the end of 2020.

- Payment initiation and account aggregating information have been added to digital banking. The move to mobile A2A payment apps is making promising progress. Instant payment schemes or domestic immediate payment schemes will be used in addition to other mobile payment services.
- Innovative European banks are pushing digital banking services and mobile payment apps that enable digital credit transfer payments directly from the bank accounts of participating banks, including mobile P2P money transfers.
- The typical digital A2A payment service use cases include QR-code initiated POS payments, online payments and also mobile P2P money transfers.
- Domestic digital account-to-account payment services are active in several countries.
  - BLIK, MobilePay, Swish and Vipps show a best practice approach.
  - Jiffy by Bancomat Pay, Bitum in Spain and Payconiq by Bancontact in Belgium have started.
  - France, Germany and Hungary are in an early stage of launching respective domestic digital A2A payment services.
- In Poland and the Nordic countries, there are new bank-backed interbank organisations which operate domestic digital A2A payment services as four-party models with the intent to add instant payments and mobile P2P payments to the digital payment service mix.

TABLE 3 – DIGITAL PAYMENT READINESS

DIGITAL PAYMENT READINESS	NO	DK	SE	UK	DE	FR	ES	IT	PL	HU
Domestic digital credit transfer payment service	Vipps	MobilePay	Swish	Faster Payments	giropay	per bank app Lyf Pay	Bizum	MyBank, Bancomat Pay	BLIK	per bank app
Domestic Open Banking payment apps				Paym, Pay by Bank App				Bancomat Pay Jiffy		
OBP Payment Use Cases	POS payments online payments P2P payments			POS payments online payments P2P payments	online payment P2P payments	POS payments online payments P2P payments				
AIS service as part of digital banking AISP services by TPPs	DNB Bank TPPs	Danske Bank TPPs	all bank apps Tink, TPPs	all bank apps TPPs						

Source: PCM research. Data collected Dec 2020 - May 2021

OPEN BANKING READINESS – INDEX 2021

Most European countries have chosen their individual ways of implementing an Open Banking ecosystem and transforming domestic cardless payment schemes into digital A2A payment schemes fit for the digital economy.

We compared ten European markets in terms of their regulatory readiness in adopting PSD2, their Open Banking API readiness and Open Banking innovation.

CRITERIA AND CATEGORIES

With a high-level business perspective in mind and taking research results from the various countries into account, ten criteria relevant for Open Banking were selected to form the OBR Index 2021 in this report (see Table 4):

- Open Banking Strategy, PSD2 implemented
- Instant payment scheme in place, digital A2A payment scheme in place
- Maturity: digital infrastructure (4G/5G), digital banking use, AIS/PIS services added to digital banking
- Open Banking licenses for TPPs, Open Banking APIs active at ASPSPs, domestic Open Banking API standard or an aggregator supported Open Banking API model in place

Compared with the OBR Index 2018, two new criteria were added to the OBR Index 2021. According to market experts, they will have future relevance for both the Open Banking ecosystem and digital A2A payment services:

- NEW: digital ID authentication schemes in country
- NEW: domestic KYC service scheme in country

In this report, 12 criteria are used to define five readiness categories reflecting the Open Banking status achieved by the ten countries in question, as things stand in March 2021 (see Table 4):

TABLE 4: OPEN BANKING READINESS CATEGORIES 2021

CRITERIA	Category 1	Category 2	Category 3	Category 4	Category 5
Open Banking strategy	✓	✓	✓	✓	✓
PSD2 implemented	✓	✓	✓	✓	✓
Immediate payment scheme	✓	✓	✓	✓	✓
Digital A2A payment scheme	✓	launched	launched	launched	---
Digital Infrastructure (4G)	>85%	>85%	<85%	<85%	<85%
Digital banking use (in %)	>85%	>85%	<75%	<60%	<60%
Digital Banking includes AIS/PIS	✓	✓	✓	rollout	rollout
Open Banking licenses for TPPs	✓	✓	✓	✓	✓
Open APIs available per ASPSP	✓	✓	✓	✓	✓
Domestic Open API standard	✓	✓	✓	variations	---
Digital ID authentication scheme	✓	---	---	---	---
KYC service scheme in country	launched	---	---	---	---

Note: Categories reflect the OBR status achieved by a country (✓ means in place).

Source: PCM research. Data collected Dec 2020 - May 2021

Note: The extension of the European Open Banking model towards Open Finance beyond payments may be a solid future trend. In March 2021, however, Open Finance initiatives are industry-led, in an early stage and out of scope for payment service regulation and Open Banking mandate of the PSD2.

Thus, potential future criteria such as Open Finance APIs, Open Finance licenses and domestic Open Finance standards were not added to the OBR Index 2021 in this report, but they may be candidates for a future study.

OBR INDEX 2021 – COUNTRIES BY OBR CATEGORY

Based on key findings for each county, Table 5 shows the Open Banking Readiness Index 2021. Compared to the previous OBR Index 2018, significant readiness progress has been observed.

OBR category 1: The Nordic countries Sweden, Denmark and Norway are the only countries where established digital ID authentication and KYC services at a pan-Nordic level are part of the Open Banking strategy.

From a pan-European perspective, the regional regulatory regimes in Nordic countries seem to be slightly more advanced regarding Open Banking ecosystems and digital payment services than other countries (see case study Invidem below).

OBR category 2: The UK market is at the forefront of Open Banking, having set its own framework and API standard. In addition, the UK launched plans to extend the Open Banking UK model towards an Open Finance framework beyond payments. However, missing digital ID authentication and KYC service schemes are noted as a variance to the pan-regional approach taken by the Nordic countries to these important issues.

OBR category 3. France, Germany and Spain are a step behind the UK. Digital A2A payment schemes are at an early stage and both digital banking use and 4G internet penetration are lower than the UK. Spain is the only country with high 5G internet penetration.

OBR category 4. Italy and Poland fall into category 4. Compared with countries such as France, Germany and Spain, digital banking use is significantly lower, and banks have different interpretations of local Open Banking API standards. Also, the process of adding AIS/PIS services to digital banking is in rollout.

OBR category 5. Compared with Italy and Poland, we have placed Hungary in a fifth category as open banking in the country is dominated by foreign banks, all of which adopted their own approach. Thus, there is no domestic Open Banking API standard and no launch of domestic digital A2A payment services.

Key Finding: Compared with the OBR Index 2018, the ten European countries included in this report have made significant progress in the last three years, and have achieved a mature level of Open Banking implementation.

The OBR Index 2021 finds that the Nordic countries and the UK are at the forefront of Open Banking, with the other six countries at an earlier stage of development. Only Hungary is a bit behind as the individual Open Banking approach of the large foreign-owned bank groups dominates the Hungarian market.

In 2021, the key challenge for Open Banking and payment service providers in Europe is the fragmented Open Banking API market. Apart from domestic Open Banking API standards, there is currently no single pan-European Open Banking API standard. However, aggregators acting as bridging Open Banking API gateways, Open Banking platform processors and Banking-as-a-Service solution providers can accelerate API integration.

TABLE 5: OPEN BANKING READINESS INDEX 2021

CRITERIA	SE	DK	NO	UK	DE	FR	ES	IT	PL	HU
Open Banking strategy										
PSD2 implemented										
Immediate payment scheme										
Digital A2A payment scheme				launched						---
Digital Infrastructure (4G)					<85%	<85%	5G: 76%	<85%	<85%	
Digital banking use (in %)					<75%	<75%	<75%	<60%	<60%	<60%
Digital Banking including AIS/PIS		rollout					rollout			
Open Banking licenses for TPPs										
Open APIs available per ASPSP										
Domestic Open API standard	in progress							variations	variations	by bank
Digital ID authentication scheme				---	---	---	---	---	---	---
KYC service scheme in country	launched			---	---	---	---	---	---	---
Open Banking Readiness Index	1 Sweden, Denmark, Norway			2 UK	3 Germany, France, Spain			4 Italy, Poland		5 Hungary

Source: PCM research. Data collected Dec 2020 - May 2021

Case Study

P27, A CROSS-BORDER PAYMENT INFRASTRUCTURE FOR THE NORDIC REGION

In February 2018, a group of major Swedish, Danish and Finnish banks banded together to explore the possibility of establishing a pan-Nordic cross-border payment infrastructure supplemented by common products.

This initiative was backed by Danske Bank, Handelsbanken, Nordea, OP Financial Group, SEB and Swedbank. These banks share current domestic infrastructure projects in Norway and Sweden but aim to achieve them on a Nordic scale with the intention of launching a new piece of financial infrastructure by 2021.

The objective is to make it possible to clear immediate payments and settle accounts within seconds, regardless of currency. The P27 project – so-called for the 27 million people who live in Sweden, Norway, Denmark, and Finland – will build on the success of mobile bank payment apps from Nordic banks such as Swish in Sweden, Norway's Vipps and MobilePay in Denmark.

This collaboration represents an effort to stay ahead of global technology giants as customers no longer rely exclusively on their bank for financial services. The difference between P27 and the payment apps already offered by Nordic banks is the cross-border nature of the project.

P27 has set a date of 2021 for the launch of its real-time, cross-border payment project. The idea is to create a real-time and batch multi-currency platform that will enable consumers and businesses to send and receive funds across the Nordic markets.

For banks, the new platform will provide a real-time view of the multiple schemes that are running, as well as participant information, balances across schemes and the addition of a data-rich message set. This information will make new revenue opportunities possible. It should be noted that the data will sit with the banks. However, thanks to real-time settlement via P27, the accounts held at the banks will be up to date more quickly.

In June 2019, P27 partnered with Mastercard. Through this partnership, the P27 Nordic Payments Platform will continue to build a Nordic multi-currency platform for real-time payments. As a first step, support and services for payments in DKK, EUR and SEK will be offered.

In October 2020, P27 took a leap forward in establishing its clearing infrastructure with an agreement, which is still pending, to acquire Bankgirocentralen (Bankgirot), Sweden's automated clearing house for mass payments. Bankgirot has a central role in the Swedish payment system and handles transactions to a value of around SEK 73 billion per day, including its real-time payment service BiR, which enables the Swedish real-time payment system Swish.

INVIDEM, THE NORDIC KYC UTILITY PROVIDER

In June 2018, six Nordic banks decided to explore the possibility of establishing a Nordic Know Your Customer (KYC) infrastructure.

DNB Bank, Danske Bank, Nordea Bank, Svenska Handelsbanken, Swedbank and Skandinaviska Enskilda Banken (SEB) established a joint venture Nordic KYC Utility called Invidem. They focused on developing a secure and cost-effective Nordic KYC infrastructure and addressing challenges in AML regulation for the Nordic market.

In late June 2019, Invidem was formally launched. Invidem is owned by the founding banks, but offers its services to third parties. The initiative will contribute to ensuring a healthy financial environment, prevent financial crime and protect customers and society.

In April 2020, Invidem signed long-term technology deals with Econompass and iMeta Technologies for automated KYC data-gathering and KYC information management ahead of Invidem's commercial launch in 2021.

Invidem will create a common Nordic platform based on advanced data management technologies to enhance the collection and management of bank customer information. Although the primary target is to enhance data competence, Invidem also aims to raise the technology competence of participating banks against the wave of well-resourced global tech giants entering the financial services space such as Google and Apple. Invidem said it will be ready for commercial launch in 2021.

In each case, the KYC information request is initiated by one of Invidem's clients. The request is "dressed" in data by Invidem using its KYC expertise and innovative technology solutions in cooperation with third-party data vendors. The client then reviews the case, which is then sent to the client's end customer for review, possible amendments and submission. Finally, the file is validated against Invidem's standards and sent to the client.

DENMARK

DENMARK

Overview

As one of the Nordic countries with a well-established online/mobile banking infrastructure, Denmark is well prepared for Open Banking. Danish banks support the pan-Nordic P27 initiative.

Denmark has a Nordic collaborative model which has created some of the most successful digital payment wallets and digital ID services. In 2017, MobilePay Denmark A/S became the new interbank organisation managing the MobilePay scheme.

By adding cross-bank payment initiation and account information to digital banking and creating the new domestic digital payment scheme, Mobile Pay, Denmark's banks are using the Nordic collaborative model to transform their proven domestic payment services and make them fit for Open Banking and the digital economy.

Before implementing PSD2 and its Open Banking mandate, Danish online and mobile banks were already focused on Nordic banking services, credit transfer payment initiation, digital ID authentication and mobile P2P payments. Clearing is undertaken by Finance Denmark using Mastercard Payments Services as the processor. Settlement of bank payments is executed through Danmarks Nationalbank' CSM service.

The proven Nordic collaborative model exemplifies the development of Open Banking in Denmark. Successful collaborations between Nordic banks have delivered modern banking and digital payment services for the region.

DIGITAL BANKING INFRASTRUCTURE IN DENMARK

The clearing and settlement of bank payments are executed through the domestic CSM service of Danmarks Nationalbank (DNB), or between the Nordic bank groups. For payments denominated in Euro, DNB and the large Nordic bank groups can handle the IBAN-based clearing and settlement of retail payments. Since November 2014, Danish banks have offered mobile instant payments to bank clients using online banking, mobile banking and MobilePay.

Denmark has high mobile phone penetration and sophisticated internet provision, with almost 88.6% of internet users enjoying 4G internet. The three Danish mobile network operators began roll-out of 5G internet in late 2019.

With around 7.3 million active mobile subscriptions, many Danes own more than one mobile and mobile device penetration stands at 125.5%. In 2019, 88.0% of mobile phone users owned a smartphone. Also, tablet penetration has jumped significantly, with 3.34 million tablet users in 2019 – equivalent to 57.4% of the Danish population.

Key Finding: With 5.3 million Danes using online banking and mobile banking, a high level of digital banking infrastructure roll-out has been achieved. In addition, the Danish state and its banks have a clear strategy for a pan-Nordic digital banking infrastructure fit for the Nordic digital economy.
Denmark has a high level of both smartphone penetration and 4G internet. The rollout of Denmark's 5G network has started slowly. The roll out of a mature online and mobile communication infrastructure is a strong enabler for Open Banking.

OPEN BANKING IN DENMARK

Denmark employs the proven Nordic collaborative model which has created some of the most successful digital payment wallets and digital ID services alongside strong card payment and credit transfer services. Most of the big Nordic Banks have an open banking strategy, but functionality is often limited to viewing accounts and transaction information. Nordea Group and Danske Bank are among Europe's frontrunners in Open Banking.

Denmark's unique eID-compliant digital identity service, NemID, has by itself been a significant driver for digitisation in the country. NemID supports authentication and digital signatures in the public sector, financial sector and with businesses.

PSD2 requires Danish banks to offer a technical bank account interface which enables TPPs to offer payment services. Danske Bank use the Open Banking UK API standard, Nordea use their own API set, and most other Danish banks use the Berlin Group's NextGenPSD2 API framework.

Denmark

In 2018, Nordic banks began transforming their banking infrastructure for Open Banking:

- Consistent with the provisions of PSD2, Danish banks now act as ASPSPs and work with independent PISPs and AISPs using the bank's API set to power their own service business. Aggregators such as Aiia and Mastercard Payments Services offer their Open Banking API set to connect Nordic banks with each other and with independent PISPs and AISPs.
- In June 2017, the Danish Financial Supervisory Authority (Danish FSA) and the Monetary Authority of Singapore (MAS) signed a FinTech co-operation agreement which aims to help FinTech companies in Singapore and Denmark to expand into each other's markets.
- Danske's Open Banking API hub – In June 2017, Danske Bank released its Open Banking service as it decided to engage in API-powered innovation. Danske Bank is looking to push on from its banking API, which stems from its expertise in developing MobilePay. Danske declared that TPPs will be able to use Danske's banking APIs to build products and services throughout the Nordics, UK and eurozone. In addition, Danske provides a sandbox environment to test API integrations with apps, as well as community support. Danske's hub community includes a network of over 6,000 Nordic start-ups, 200 investors and expert advisors.
- Account Aggregation Services – In January 2018, Danske Bank revamped its mobile app to let Nordic customers view data from their accounts with other providers. From April 2018, Swedish customers were able to gather payment and bank details from all their bank accounts and view these in a single app. Denmark, Norway and Finland followed later in 2018.
- In January 2018, the Nordic processor, NETS, launched the first Open Banking Aggregator service in Norway and Denmark with several Norwegian banks as clients. The service is utilised by banks to enable account information aggregation and payments across banks. In March 2021, the NETS Open Banking aggregation service was acquired by Mastercard and is offered to clients via Mastercard Payments Services.
- In December 2018, Danske Bank and DNB Bank (N) invested €5.2 million in the Nordic API Gateway, a data sharing utility launched by account aggregation and budgeting app Spiir. Founded in 2011, more than 390,000 Nordic customers use Spiir to manage their budgets, monitor their spending and find less expensive alternatives for their fixed expenses. For the account aggregation element, Spiir has set up its own Open API gateway as a data sharing utility for banks in advance of the development of individual bank API platforms.
- In May 2020, Nordea announced the addition of Tink's account aggregation and personal financial management technology to its mobile app for Sweden, Norway, Finland and Denmark. The new features allow app users to get an overview of their finances in one place: card transactions, mortgages, savings, loans and current accounts, including those from other banks.
- Danske Bank and DNB Bank (Norway) are bidding to position Nordic API Gateway as a Nordic aggregator for PSD2. In April 2021, Nordic API Gateway changed its name to Aiia.
- In 2018, Lunar Way was the first company to receive a PISP license in Denmark, followed by the Nordic API Gateway in 2019. Danish-based Inpay and foreign PISPs offer online credit transfers in the country, including Trustly (S) and Klarna's SOFORT (D). Authorised in another EEA member state, cross-border PISPs have provided notification of operating in Denmark under the EU passport system.
- In early 2021, Mastercard Payment Services launched the first commercial PISP service branded Account Checkout, which enables consumers to pay by account from any Danish bank, but without the need to enter any account numbers other than their eID credentials. By March 2021, Account Checkout was being offered to corporates in the Danish market.

Key Finding: By taking advantage of the Nordic collaborative models and pan-European developments such as PSD2, Denmark is transforming its proven payment infrastructure towards Open Banking, and is developing its Danish mobile payment service scheme, MobilePay, which is open to other Nordic bank clients with a Danish bank account.

Danske Bank added AISP services and immediate payments to mobile banking on demand, including regulatory standards such as RTS on SCA and common secure access. Other Danish banks are expected to follow suit. As a next step in the Danish collaborative model, several Danish banks support the pan-Nordic P27 initiative and the Nordic KYC Utility provider, Invidem.

Danish banks provide Open Banking API access in combination with aggregators which provide connectivity between Nordic banks with each other and independent PISP/AISPs. This approach may be a basic step towards a potential future Nordic Open Banking API set as part of a Nordic cross-border payment infrastructure.

In 2020, five PISPs and nine AISPs were granted licenses by Finanstilsynet, including well-known players from the card payments industry. In total 13 TPPs and as well as 102 foreign TPPs with EU passports can connect to Danish banks via that bank's API set.

DENMARK

Readiness Index Position

OPEN BANKING READINESS INDEX: CATEGORY 1

Internet Use:

95%	97%	87%	84%	74%
Households with internet access	Last internet use (12 months)	Internet users who bought online	Last online purchase (12 months)	Last online purchase (3 months)

Digital Communication Infrastructure:

Mobile phone subscription:	Smartphone penetration:	4G LTE internet penetration:	Digital banking penetration:
125.5% PER CAPITA	88% OF MOBILE PHONES	88.6% 5G NETWORK LAUNCHED	94% OF 14-76 AGED CAPITA

Bank-backed Open Banking Infrastructure:

- Open Banking regulation: PSD2 implemented 2019
- Open Banking licenses: 5 PISPs, 9 AISPs licensed in Denmark by Finanstilsynet, 102 TPPs passported
- Open Banking APIs: Open Banking API access model in combination with aggregators
- Payment initiation services: digital payment scheme MobilePay: online, POS, P2P
- Instant payment services: will be added to digital banking
- Instant payment initiation: online: MobilePay, POS: MobilePay, P2P: MobilePay
- Account information services: in 2018, Danske Bank was first

Case Study

DENMARK'S DIGITAL PAYMENT SERVICE MOBILE PAY + NEMID AUTHENTICATION

In 2013, Danske Bank launched MobilePay in Denmark (in May) and in Finland (in December). Ten weeks after its public launch, the MobilePay solution was downloaded almost 300,000 times, with 48% of those downloading the app being non-Danske Bank customers.

Danske Bank already offers mobile banking services for its customers, but the new MobilePay solution is accessible for all non-Danske Bank customers. In May 2015, Danske added PowaTag technology to the MobilePay app. By integrating PowaTag, MobilePay can enable mobile payments from more than 1,200 companies around the world.

In October 2016, Nordea Bank branches in Denmark left the Swipp app collaboration and opted for MobilePay. In October 2017, Danske terminated MobilePay in Norway in favour of supporting the Norwegian Vipps app instead.

In 2017, MobilePay became a separate entity, MobilePay Denmark A/S. This follows the launch of the new partnership model in 2016, with almost all Danish banks joining the MobilePay partnership.

In 2018, MobilePay launched a bill-sharing app inside its main app called Box. This app enables team subscriptions, the sharing of bills between friends and other P2P money transfer services. In March 2018, Danske Bank (DK) invited Finnish banks to join MobilePay.

MobilePay is the most popular mobile payment service in Denmark and Finland. As of 2019, 81% of Danish consumers use MobilePay, and it has overtaken Facebook as the most used app in Denmark.

MobilePay allows Danish users to make mobile P2P money transfers, mobile payments in-store and online purchases. For P2P money transfers, the user selects the recipient's mobile number.

After subscribing to the service, MobilePay users no longer need to exchange account details or card credentials or use NemID, the secure Danish sign-on authentication procedure. However, MobilePay users must have a Danish CPR-number, a unique NemID number, a Danish bank account, a Danish credit card or Dankort debit card and a Danish mobile number.

In 2019, MobilePay had around 4.1 million registered users in Denmark and 1.5 million registered users in Finland. More than 140,000 stores and online shops accept MobilePay payments, 20,000 more than at the beginning of 2019. In 2019, MobilePay's total payments exceeded 330 million, growth of 50 million transactions compared to 2018. In 2019, the transaction value on MobilePay totalled DKK 102 billion, DKK 22 billion more than in 2018.

NemID – The digital ID service NemID was launched in July 2010. It is a common secure log-in authentication solution for online banking services and mobile banking apps from Danish banks, government websites and some other private companies.

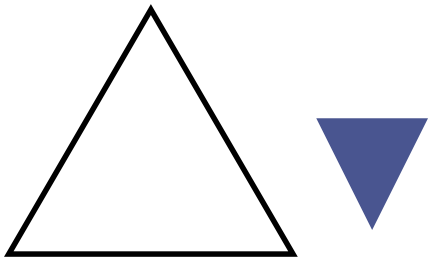
NemID is managed by DanID and processed by NETS. Everyone in Denmark over the age of 15 with a CPR-Number is eligible for a NemID to be used with their bank as well as public institutions. Anyone over 13 years old may use a NemID for online banking services and mobile banking apps.

By mid-2021, NemID will be replaced by MitID that will offer enhanced and more flexible eID services, but still based on a common core eID infrastructure.

FRANCE

FRANCE

Overview



France is a large European retail banking market with a well-established online/mobile banking infrastructure including instant payments.

Historically, there were no collaborative, iterative approaches to next-generation payments in the country. Banks adopted their own approaches to the delivery of modern banking and digital payment services.

Before implementing the revised payment service directive, PSD2, French banks have developed online banking and mobile banking at an individual bank level. In contrast to many other countries, there is a de-facto electronic banking standard used at a domestic level, the Electronic Banking Internet Communication Standard (EBICS).

With the advent of PSD2, however, French banks have begun to push for digital account-to-account payments and mobile P2P payments in parallel to cards. In 2018, French banks began to add account information services to their individual online banking services and mobile banking apps.

From a pan-European perspective, French banks have implemented in-house account aggregation and payment initiation services and instant payments that aim to transform domestic payment solutions into digital payment services fit for the digital economy. France is one of the European countries which has launched Open Banking API standard sets at a domestic level.

DIGITAL BANKING INFRASTRUCTURE IN FRANCE

France is a part of the SEPA initiative for retail payments denominated in euros. In November 2020, 267 French banks participate in the SEPA Credit Transfer Scheme (SCT), and 123 in the SEPA Instant Payment Scheme (SCT Inst).

The Banque de France and the country's large banking groups can handle IBAN-based clearing and settlement of retail payments. Since 2018, clearing and settlement mechanisms have supported instant payment services, such as EBA CLEARING RT1. In 2020, more than 50% of all IBAN-based payments in France were processed intra-day, or even immediately, inside the same bank group.

France's large telecom market has one of the highest mobile penetration rates in Europe, with almost 79.7% of internet users enjoying 4G internet. 5G internet was launched in November 2020. In January 2021, mobile network operator Orange's 5G network reached 160 cities across France.

With around 74.6 million active mobile subscriptions, many French citizens own more than one mobile, and mobile device penetration stands at 110.6 percent. In 2019, 77.5% percent of mobile phone users owned a smartphone, and more than 60% percent of internet users said they use a tablet PC.

Key Finding: France has made progressive improvements in both smartphone penetration and 4G investment. The rollout of France's 5G network began in November 2020.

Having in mind recent merger activities such as Worldline, Ingenico and Thales, the French state and France's payments industry show a clear strategic intent to modernise the country's banking infrastructure, transforming them into a banking infrastructure fit for the digital economy.

The ongoing rollout of a mature online and mobile communication infrastructure will act as an enabler for Open Banking.

OPEN BANKING IN FRANCE

Whilst an ordinance putting PSD2 into national legislation – amending France's Monetary and Financial Code (MFC) – was published in August 2017, there has not been significant government involvement in Open Banking. The French government appears to have taken a more laissez-faire approach compared to the UK.

Open Banking in France has been implemented by the country's six major banks through their jointly-owned processing company, STET. STET is responsible for processing more than 24 billion transactions a year, representing an average of €25 billion per day. STET created the French Open Banking API standard sets for the country's banks, aiming to provide a secure and easy-to-use set of services to be implemented TPPs:

- AISP (Account Information Service Providers)
- CBPII (Card Based Payment Instrument Issuers)
- PISP (Payment Initiation Service Providers)

France

In 2018, French banks began to embrace both Open Banking and digital instant payments:

- BNP Paribas and Crédit Agricole have been among Europe's frontrunners in Open Banking. The other large French bank groups BPCE, Crédit Mutuel, Société Générale and HSBC followed suit.
- French banks have opted for the French Open Banking API standard launched by STET in 2018, alongside their own API sets. These standards are used to connect with third-party FinTech partners operating cross-border or based in France.
- Consistent with the provisions of PSD2, French banks act as ASPSPs and work with independent PISPs and AISPs using their own API sets to power their own service business. In addition, French banks have added account information services and instant payment services to their online banking services and mobile banking apps.
- However, the large French bank groups and foreign banks such as ING Group may adopt their own approach beyond the Open Banking API from STET.
- In parallel, French banks have begun to cooperate with selected trusted FinTech partners to create added value services which they market together. Selected trusted FinTech partners may include PISPs, AISPs, consumer credit finance partners, personal finance management partners (PFMs), and/or ETF broker advisors.
- Many French bank clients can use the account information statements and payment transaction histories from their other bank accounts, with this information aggregated and categorised in real-time at each login. This enables clients to undertake personal finance management by themselves in a single app, or to take advantage of mobile apps from independent PFM service providers.
- In January 2018, French payment service processor Worldline and iSignthis launched Paydentity services across Europe. ISXPay combines the RegTech capabilities of iSignthis with Worldline's acquiring capabilities to offer merchants and FinTechs AML compliance services. Paydentity's services include customer due diligence, identity verification, payment acceptation and authentication solutions, transaction monitoring and original credit transfers (OCT), coupled with Worldline's VISA/Mastercard acquiring, settlement and clearing services. The iSignthis tool is designed to help e-commerce merchants, fintech companies and cryptocurrency product exchanges comply with the monitoring and authentication requirements of the Anti-Money Laundering Directive, 5AMLD, and the regulatory technical standards of PSD2.
- In November 2019, Société Générale said that it was releasing an API for embedding in legacy back-end infrastructures to handle instant payments. The dedicated service targets financial and electronic money institutions whose technical infrastructures do not allow them to make instant payments available to their users. Supported by Transactis, SocGen has developed an API that integrates directly into each client's banking processes and information systems. Once installed, clients will be able to offer their end-users instant payment, both in transmission and reception, denominated in euro. Payments will be processed over SocGen's infrastructure with a guarantee of ten-second delivery to recipients.
- In February 2021, Open Banking solution provider Nuapay extended its Open Banking payment services to French banks.

Key Finding: On 10 August 2017, the first transposition of PSD2 was adopted in France. The French government updated its regulations in September 2017 and added various laws to help towards its application.

By taking advantage of pan-European developments such as PSD2, France's banks are progressing towards a full Open Banking environment. In particular, STET's launch of a French Open Banking API standard set is a significant development.

French banks can add AISP services and immediate payments to mobile banking on demand, given that regulatory standards, including RTS on SCA and common secure access, have been implemented and PISP services are undertaken in-house.

In 2020, 12 PISPs and 20 AISPs were granted licenses by the ACP, including well-known players from the card payments industry. In total 23 TPPs and 115 foreign TPPs with EU passports can connect to French banks via that bank's API set.

In summary, French banks have developed a competitive Open Banking strategy and have established a digital A2A payment platform fit for the digital economy.

FRANCE

Readiness Index Position

OPEN BANKING READINESS INDEX: CATEGORY 3

Internet Use:

90%	91%	77%	70%	58%
Households with internet access	Last internet use (12 months)	Internet users who bought online	Last online purchase (12 months)	Last online purchase (3 months)

Digital Communication Infrastructure:

Mobile phone subscription:	Smartphone penetration:	4G LTE internet penetration:	Digital banking penetration:
110.6% PER CAPITA	77.5% OF MOBILE PHONES	79.7% 5G NETWORK LAUNCHED	69% OF 14-76 AGED CAPITA

Bank-backed Open Banking Infrastructure:

- Open Banking regulation: PSD2 implemented 2018
- Open Banking licenses: 12 PISPs, 20 AISPs licensed in France by ACP, 115 TPPs passported
- Open Banking APIs: Open Banking API standard STET, API sets per bank
- Payment initiation services: Lyf Pay and per bank app: online, POS, P2P
- Instant payment services: added to digital banking
- Instant payment initiation: Lyf Pay and per bank app: online, POS, P2P
- Account information services: all banks offer account aggregation

Case Study

LYF PAY, A MOBILE PAYMENT APP BACKED BY FRENCH BANKS

The Open Banking mandate has had an initial indirect impact on the French payments industry. This could transform payments in a country dominated by cards as a means of cashless payment.

The French domestic card scheme, Carte Bancaire, can be used for online payments in online shops and for mobile payments in-app. Given this context, French banks have launched their own mobile banking apps with immediate mobile P2P money transfer services in France, as well as mobile HCE card payments.

However, 2016 saw the launch of a bank-backed mobile payment app, Lyf Pay, in France.

Lyf Pay – Lyf Pay is a QR-code-based mobile payment platform that lets consumers make in-store payments, online payments, and mobile P2P payments as well as allowing them to store loyalty cards, coupons and special offers on their mobile device. The Lyf Pay wallet can be funded via card or bank transfer initiated by the consumer, with the guarantee of still being able to claim their usual personal loyalty benefits, plus coupons and special offers. Lyf Pay stemmed from the merger of BNP Paribas' Wa! and Crédit Mutuel's Fivory wallets in October 2016. Auchan Retail France, Mastercard, Oney Bank and the petrol company Total ae also part of the Lyf Pay initiative.

GERMANY

GERMANY

Overview

As Europe's most populous country with a powerful economy and a well-established online/mobile banking infrastructure, it comes as no surprise that Germany is well prepared for Open Banking. After an initial phase of resistance, German banks have embraced the Open Banking challenge.

Germany's commercial banks, savings banks sector and cooperative banks collaborate with trusted third-party FinTech partners at an individual bank level. Most German banks have implemented inter-bank account information services, as well as instant payments to their online and mobile banking services.

In addition, German banks have opted for the Open Banking API standards of the Berlin Group, NextGenPSD2 and NextGenMobileP2P, alongside their domestic online banking API standard, FinTS.

Germany's proven collaborative, iterative approach to next-generation payments typifies its development of Open Banking. Germany's approach may be characterised as successful interbank-collaboration between various tiers of savings, cooperative, and commercial banks, taking advantage of pan-European developments such as PSD2 and SCT-Inst to deliver modern banking and digital payment services.

GERMAN DIGITAL BANKING INFRASTRUCTURE

The clearing and settlement of bank payments are executed bilaterally between bank groups or through the Bundesbank's CSM service.

The Bundesbank and the country's large banking groups can handle IBAN-based clearing and settlement of retail payments. Since 2018, clearing and settlement mechanisms support instant payment services, such as EBA CLEARING RT1. In 2020, more than 50% of all IBAN-based payments in Germany were processed intra-day, or even immediately, inside of the same bank group.

Germany has Europe's second-highest penetration of mobile phones, and sophisticated internet provision, with almost 76.9% of internet users enjoying 4G internet. In 2020, the new 5G service was launched, and the roll-out of 5G network infrastructure began.

The German mobile market is the largest in Europe. With about 106.7 million active mobile subscriptions, many Germans own more than one mobile, with 128.4% mobile device penetration. In 2019, 79.9% of mobile phone users own a smartphone, and 63.4% of internet users said they use a tablet PC.

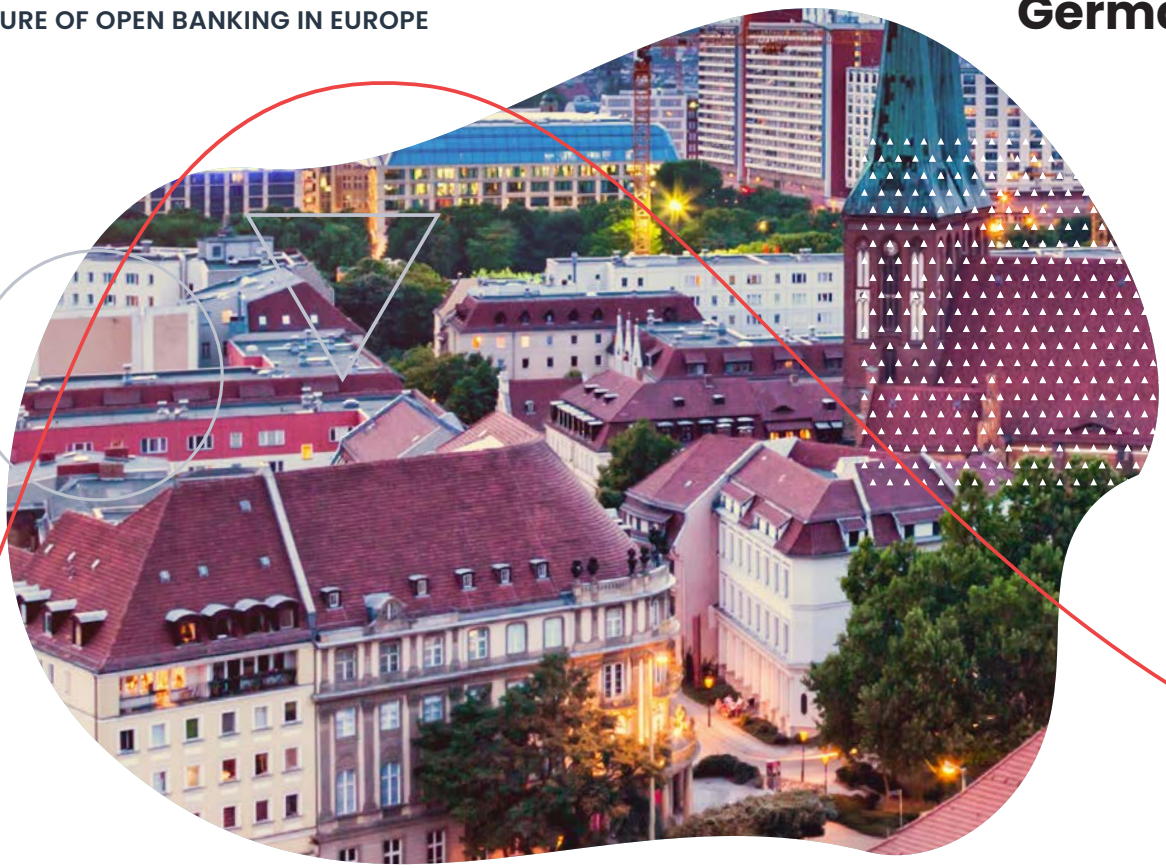
Key Finding: With 50.7 million Germans using online banking and mobile banking, the rollout of digital banking infrastructure in Germany has gained momentum. The country's mature online and mobile communication infrastructure will prove to be an enabler for Open Banking.

OPEN BANKING IN GERMANY

After an initial phase of resistance, German banks have embraced Open Banking:

- Historically, Klarna's SOFORT acted as independent PISP de-facto tolerated by German banks. Legalised by the Open Banking mandate of the PSD2, Klarna offers cardless payment services directly from the consumer's account, including mobile P2P services and merchant account management.
- German banks have opted for the Berlin Group's Open Banking API standards, NextGenPSD2 for XS2A and NextGenMobileP2P, alongside their domestic online banking API standard, FinTS. These standards are used by German banks to connect with trusted third-party FinTech partners operating cross-border or based in Germany.
- For both domestic Open Banking services and intra-group Open Banking services, German banks continue using the proven FinTS standard, which remains the dominant access method in the country as its scope goes beyond PSD2 regulation. The NextGenPSD2 and NextGenMobileP2P standards are used to connect with new and/or cross-border PISPs and AISPs. Foreign banks' German branches and subsidiaries may use the Open Banking API set of their respective parent bank group.
- Commercial banks, savings banks and cooperative banks work with trusted third-party FinTech partners at group level for each bank. Savings banks and cooperative banks are coordinated and supported by their respective central organisation and single bank sector processor.

Germany



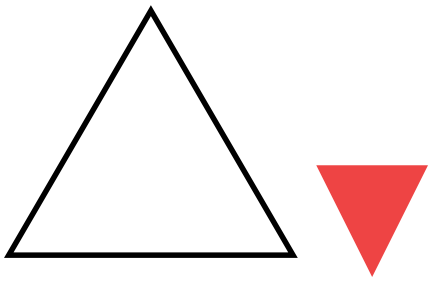
- In line with PSD2, German banks act as ASPSPs and work with independent PISPs and AISPs using a bank's API set just to power their own service business, such as Klarna and competing German ELV direct debit service providers.
- In 2020, many German banks added a new XS2A-control function to their online banking solutions. These bank clients are kept informed regarding those PISPs and AISPs that have accessed their current accounts. Clients are also able to take preventive action in the event of XS2A-access without their explicit consent.
- In December 2020, the German savings banks and a few other banks were the first to get BaFin's permission for an exemption that prevents TPPs from accessing bank accounts by any means other than the bank's Open Banking API set.

Key Finding: Germany's progress towards a full Open Banking environment can be characterised by the country's strong track record of cross-industry collaboration and innovation. The rollout of Open Banking in Germany has gained momentum. Intending to take advantage of pan-European developments such as PSD2 and SCT-Inst, German banks are in the stage of defining a digital strategy capable of delivering Open Banking payment services.

In 2020, account information and payment initiation services have been put in place. Also, RTS SCA and RTS XS2A requirements have been implemented for digital payment services directly from bank accounts. Also in 2020, 24 PISPs and 35 AISPs were granted licenses by BaFin, the German financial market regulator, including well-known players from the card payments industry. In total 23 TPPs and as well as 112 foreign TPPs with EU passports can connect to German banks using that bank's Open Banking API set. Including Klarna's SOFORT, around 20 aggregators can connect TPPs with German account holding banks. There are two Open Banking API sets selected by German banks, FinTS and NextGenPSD2.

Apart from digital banking, there is no domestic German digital instant payment service comparable with bank-owned digital payment services such as BLIK in Poland, Bancomat Pay (Jiffy) in Italy or Payconiq in Benelux. The integration of Open Banking payments directly from the consumer's account into existing retail payment checkouts remains a challenge for future implementation. At present, this is restricted to QR-code initiated mobile payments online and 1D-barcode initiated cash-advances in retail outlets.

GERMANY



Readiness Index Position

OPEN BANKING READINESS INDEX: CATEGORY 3

Internet Use:

95%	94%	84%	79%	71%
Households with internet access	Last internet use (12 months)	Internet users who bought online	Last online purchase (12 months)	Last online purchase (3 months)

Digital Communication Infrastructure:

Mobile phone subscription:	Smartphone penetration:	4G LTE internet penetration:	Digital banking penetration:
128.4% PER CAPITA	79.9% OF MOBILE PHONES	76.9% 5G NETWORK LAUNCHED	65% OF 14-76 AGED CAPITA

Bank-backed Open Banking Infrastructure:

- Open Banking regulation: PSD2 implemented 2018 into German law: ZAG, BGB, GWG
- Open Banking licenses: 24 PISPs, 35 AISPs licensed by BaFin (D), also: 112 TPPs passported
- Open Banking APIs: FinTS, NextGenPSD2, NextGenMobileP2P, API sets per bank group
- Payment initiation services: online: giropay, paydirekt, POS: none
- Instant payment services: are part of digital banking
- Instant payment initiation: online: none, POS: none, P2P: kwitt
- Account information services: are part of online banking services and mobile banking apps

Case Study

OPEN BANKING IN GERMANY: BACK TO THE FUTURE?

At a domestic level, Germany's banking and payment systems have long been leaders in interoperability and connectivity. As long ago as 1998, standard interfaces for interoperability were being created such as HBCI, which enabled dialogue between different banking platforms. Then in 2002, the FinTS standard enabled consumers to access accounts from different providers on a single platform, thus realising one of the key promises of Open Banking.

Further developments – including screen-scraping to enable sharing data between corporates and banks in 2004, and the EBICS standard for data exchange – have arguably taken the German financial industry far beyond the provisions of PSD2. At present, German consumers have access to easy account switching through FinReach, as well as the option to benefit from wealth management, insurance and other services delivered by multiple providers through a single portal. On the corporate side, SMEs can access rapid credit transfers through SOFORT, as well as other enhanced banking and financial services in loans and investments.

However, these services are based on standards specific to Germany. At present, Germany is in a transition period during which services such as HBCI and FinTS will still be used until such time as PSD2-compliant services are widely used and accepted. This remarkable situation, in which Germany waits for other countries to achieve its levels of adoption and interoperability, has led to a rash of take-overs in the German Open Banking market, as international players look to acquire market share rapidly in the country's lucrative banking and payment services.

Most recently Tink, the Swedish open banking start-up, has acquired German provider FinTecSystems, making it the third domestic open banking firm to be acquired or merged in recent years. In December 2018, German credit bureau Schufa acquired a majority stake in Munich-based FinAPI. This was followed by Finleap's purchase of FIGO in 2019.

These acquisitions, taken with what's perceived to be the step backwards in standards represented by PSD2, have led to some hand-wringing in the German specialist media. Commentators are asking whether Germany's road to fully open banking services has not been hampered by a lack of expansionist ambition on the part of its FinTechs, and the extent to which Germany's open banking players should be focusing more on international markets.

While PSD2 may represent a step back in capabilities for German connectivity, there is a longer-term prize available in terms of international opportunities in Europe and beyond the borders of the EU. However, this will require both time – to focus on developing PSD2-compliant versions of Germany's successful domestic services – and the will to go out and seek investment internationally, as well as developing partnerships across borders to translate Germany's domestic open banking environment into something fit for a wider canvas.

HUNGARY

HUNGARY

Overview

Hungary has a well-established online/mobile banking infrastructure. Dominated by foreign-owned bank groups, Hungarian banks have developed online banking services, mobile card payment apps and Open Banking at the level of individual banks. Since 2019, the Hungarian banking infrastructure has had a new domestic immediate payment scheme.

In 2019, Hungarian banks began to add account information services to their individual online banking services and mobile banking apps. From a pan-European perspective, Hungarian banks have created in-house PISP and AISP services. The next step is the transformation of domestic payment solutions into omnichannel payment services fit for the digital economy.

Before implementing PSD2, Hungarian online/mobile banking was focused on domestic banking services. Historically, there were no collaborative, iterative approaches to next-generation payments in the country. The large European bank groups active in Hungary adopted their own approaches to modern banking and digital payment services. With the advent of PSD2, however, Hungarian banks have begun to push for digital credit transfer payments and mobile P2P payments.

DIGITAL BANKING INFRASTRUCTURE IN HUNGARY

The clearing and settlement of bank payments is executed through the bank-backed domestic CSM mechanism, GIRO Zrt (GIRO). GIRO is the automated clearing house operator in Hungary that supports the interbank clearing and settlement of credit transfers and direct debits.

In December 2016, a proposal from MNB for the launch of an instant payments service in Hungary was approved by the country's Financial Stability Board. In January 2018, MNB selected the Nordic processor NETS Group (DK) to provide an instant payments system for GIRO Zrt.

The development and implementation of a central bank infrastructure for instant payments, AZUR, is an historic step not only for GIRO Zrt, but for the entire Hungarian financial system as it will bring changes and significant advantages to all participants in the national payment ecosystem. AZUR includes a 'Request To Pay' service.

The new payment system operates 24/7/365 and settles all single credit transfers up to the value of HUF 10 million within five seconds. It will also enable consumers to initiate instant credit transfers using just a mobile telephone number – meaning that the payer does not need to know the payee's bank account details to transfer funds.

GIRO has operated the AZUR platform since July 2019, allowing the banking community to test the platform and gain experience with instant payments. In March 2020, instant payment functionality was officially launched through GIRO. To support the expansion of electronic payments, GIRO updated its clearing fee strategy by moving to a new load-based pricing model which differed from the former transaction-based approach. This means that members have not been charged transaction clearing fees since January 2019.

Due to regulations implemented by the MNB, all banks and other payment service providers introduced the service simultaneously. As a result, HUF 3,800 billion was settled by instant payments in the first three months after launch in March 2020.

Erste Bank Hungary and OTP Bank selected immediate payment solutions for both the domestic AZUR scheme in Hungary and the pan-European schemes, including SCT-Inst and TARGET Instant Payment Settlement (TIPS).

Hungary has high mobile phone penetration and sophisticated internet provision, with 91.4% of internet users enjoying 4G internet. The roll out of 5G internet began in April 2020. The "5G for Hungary" strategy aims for the efficient implementation of a 5G network in Hungary that will offer citizens access to the latest technologies while giving Hungarian entrepreneurs a competitive advantage.

Hungary's mobile market is one of the largest in Central and Eastern Europe. With around 10.4 million active mobile subscriptions, many Hungarians own more than one mobile, and mobile device penetration stands at 106.1%. In 2019, 73.9% of mobile phone users owned a smartphone, and 25% of Hungarian households said they used a tablet PC.

Hungary

Key Finding: Hungary has made progressive improvements in both smartphone penetration and 4G investment. The launch of Hungary's 5G network started in 2020.

The Hungarian state and Hungary's payments industry have a clear strategy to modernise the country's banking infrastructure, transforming them into a banking infrastructure fit for the digital economy. As a first step, Hungary implemented its first immediate payment scheme, AZUR. The ongoing rollout of a mature online and mobile communication infrastructure will act as an enabler for Open Banking.

OPEN BANKING HIGHLIGHTS IN HUNGARY

- In 2015, leading Hungarian banks launched mobile HCE NFC payment services as a first step in transforming their banking services into a banking infrastructure fit for the digital economy. Hungarian bank clients can make mobile HCE NFC card payments in their mobile banking apps or use Apple Pay and Google Pay.
- In 2019, GIRO launched the new instant payment system, AZUR, for immediate credit transfer payments on behalf of Hungarian banks.
- From a licensing perspective, one major event was the entry into force of Act CCXXXV of 2013 on Certain Payment Service Providers, amended to ensure compliance with PSD2. Pursuant to the amendment, the MNB registered the first payment institution providing account information services only in early 2019, then registered other payment institutions with these activities.
- In 2019, the MNB – in line with EU practice – provided an extended deadline of 31 December 2020 for the Hungarian card payment sector to implement Strong Customer Authentication legislation, consistent with the European Banking Authority's decision. The MNB is encouraging domestic participants to use the strong authentication procedure for online commerce payments carried out by cards as soon as possible with the goal of increasing online transaction security.

In 2019, Hungarian banks began to embrace Open Banking:

- Historically, Hungarian banks have launched mobile banking apps and mobile HCE NFC card payments.
- Consistent with the provisions of PSD2, Hungarian banks act as ASPSPs and work with independent PISPs and AISPs using the bank's API set to power their own service business.

Key Finding: By taking advantage of pan-European developments such as PSD2, Hungary's progress towards a full Open Banking environment is at an early stage. So far, there is no Open Banking API standard at a domestic level. However, Hungarian banks and the large European bank groups active in Hungary use their Open Banking API sets at a group level. Independent aggregators can provide connectivity between Hungarian banks and between independent PISP/AISPs.

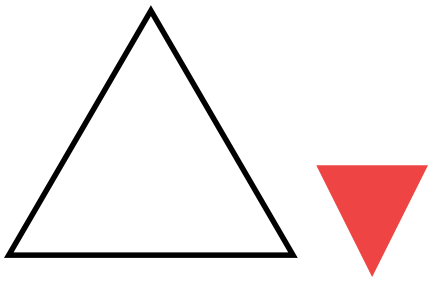
European bank groups in the Central and Eastern Europe (CEE) region are drivers for the delivery of further Open Banking payment services. These include the new immediate payment scheme AZUR denominated in HUF, and the fast-growing mobile payment apps from Hungarian banks.

In 2020, one PISP and five AISPs were granted licenses by MNB, including well-known players from the card payments industry. In total five TPPs and as well as 90 foreign TPPs with EU passports can connect to Hungarian banks via that bank's API set.

At present, Hungarian banks have not added a new XS2A-control function to their online banking solutions. Doing so would enable bank clients to be kept informed regarding the PISPs and AISPs that have accessed their current accounts. Clients would also be able to take preventive action in the event of XS2A-access without their explicit consent.

For the time being, there is no domestic Hungarian digital instant payment service comparable with bank-backed digital A2A payment services such as BLIK in Poland, Bancomat Pay (Jiffy) in Italy or Payconiq in Benelux.

HUNGARY



Readiness Index Position

OPEN BANKING READINESS INDEX: CATEGORY 5

Internet Use:

87%	90%	54%	49%	35%
Households with internet access	Last internet use (12 months)	Internet users who bought online	Last online purchase (12 months)	Last online purchase (3 months)

Digital Communication Infrastructure:

Mobile phone subscription:	Smartphone penetration:	4G LTE internet penetration:	Digital banking penetration:
106.1% PER CAPITA	79.3% OF MOBILE PHONES	91.4% 5G NETWORK LAUNCHED	51% OF 14-76 AGED CAPITA

Bank-backed Open Banking Infrastructure:

- Open Banking regulation: PSD2 implemented 2019 into Hungarian law
- Open Banking licenses: 1 PISPs, 5 AISPs licensed in Hungary by MNB, 90 TPPs passported
- Open Banking APIs: API sets per bank, independent aggregators provide connectivity
- Payment initiation services: mono-line bank apps
- Instant payment services: will be added to digital banking
- Instant payment initiation: no service such as BLIK in place; focus: mobile HCE NFC card payments
- Account information services: in 2019 added to online/mobile banking

Case Study

MOBILE BANKING AND MOBILE PAYMENTS IN HUNGARY

High levels of foreign ownership is one of the reasons why Hungarian banks implemented individual mobile banking apps, mobile payment apps and mobile P2P money transfer services.

In 2019, the number of mobile card payments executed through mobile payment apps quadrupled. As a result, 3% of transactions conducted with payment cards issued in Hungary by number and 2% by value took place through mobile payment apps from domestic payment service providers. Although these ratios still appear low, they represent a four-fold increase over the values registered in 2018.

The large European bank groups active in Hungary and the CEE region have launched mobile banking apps and mobile payment services for their clients. Some examples are documented below:

Simplepay – In February 2014, OTP Bank added a digital payment wallet, Simplepay, to its mobile banking app, Simple. This allows consumers to pay in stores by scanning a QR-code placed next to the cash register. The use of QR-codes means that merchants do not need a POS terminal to introduce Simplepay.

Simplepay can also be used to make online payments by entering the shopper's mobile phone number during checkout. Since November 2015, the Simplepay online credit card payment system has been made available to more than 2,000 online merchants. In June 2017, OTP Bank launched its mobile HCE NFC card payment solution for in-store payments, which has been added to its mobile banking app, Simple. The mobile banking app Simple and Simplepay have been rolled out to OTP's clients across the CEE region.

George – In 2018, Erste Bank launched its new mobile banking app, George, in Hungary.

In 2015, Erste Bank launched its new digital banking platform and mobile banking app, George, in Austria. Once downloaded and activated, the wallet allows online banking, in-app credit transfers, account information, cardholder information and the geo-blocking of cards. From May 2019, George's mobile pay function supports mobile HCE NFC payments on cards.
In June 2019, George hit the two million user mark in Austria, 1.5 million in Czechia and 350,000 in Slovakia. Launches in Czechia and Slovakia in 2017 were followed by a launch in Romania with 200,000 users in 2018, then launches in Hungary and Croatia in 2019 and in Serbia in 2020.

As a mobile app, George is therefore available to all 16.2 million Erste Group clients. By year-end 2019, George users numbered 5.4 million across the CEE region, with about 5,000 users added each day.

UniCredit – In 2019, in line with its Mobile First strategy, Unicredit Bank Hungary launched a mobile banking app and mobile HCE NFC payments for the CEE region. In addition, UniCredit worked on enhancing its mobile app by enabling clients to log in with biometric ID. It also introduced a biometric ID option to authenticate transactions on mobile devices with fingerprint scanning capability.

ITALY

ITALY

Overview

Italy is a large European retail banking market, with a well-established online/mobile banking infrastructure, including instant payments. After a slow start, Italy is looking to Open Banking to transform its payments space.

Prior to implementing PSD2, Italian online/mobile banking was focused on domestic banking services, and there was no collaborative, iterative approach to next-generation payments in the country. The banks adopted their own approach to the delivery of modern banking and digital payment services.

With the advent of PSD2, however, Italian banks are pushing for digital payments directly from bank accounts and mobile P2P payments in parallel to Open Banking implementations.

In 2019, early-mover Italian banks began to add account information aggregation and in-house PISP and AISP services to their individual online banking services and mobile banking apps. In addition, Italian banks have created a new domestic immediate payment scheme, Bancomat Pay (previously known as Jiffy), to allow the transformation of domestic payment solutions into omnichannel payment services fit for the digital economy.

DIGITAL BANKING INFRASTRUCTURE IN ITALY

Between 2008 and 2012, interbank organisations such as IBPCI and SIA and the governance model of the Italian payments industry were reshaped to strengthen the Italian payment system. In 2021, the most significant Italian interbank organisation is Bancomat S.p.A. (previously Consorzio Bancomat), a limited company owned by Italian banks.

The Bank of Italy and the country's large banking groups can handle IBAN-based clearing and settlement of retail payments. Since 2018, clearing and settlement mechanisms have support instant payment services, such as EBA CLEARING RT1. In 2020, more than 50% of all IBAN-based payments in Italy were processed intra-day, or even immediately, inside the same bank group.

Italy introduced mandatory real-time electronic sales invoice issuance and reporting from 1 January 2019. All relevant invoices have to be issued and submitted to the Italian Revenue Agency's e-invoicing platform, Sistema di Interscambio (SdI). In November 2020, Italy announced an extension of its SdI e-invoicing regime to cross-border invoices, to apply from January 2022.

Italy's large telecom market has one of the highest mobile penetration rates in Europe, with almost 79.0 percent of internet users enjoying 4G internet.

The project to introduce 5G mobile services was launched to great fanfare in October 2018. Italy held auctions - two years before its neighbour France. However, the high prices paid for frequencies, coupled with Italy's slow bureaucracy, have proved a headache for Italian mobile network operators. Thus, the rollout of 5G internet began slowly in 2020.

With around 80.3 million active mobile subscriptions, many Italians own more than one mobile, and mobile device penetration stands at 133.1%. In 2019, 60.8% percent of mobile phone users owned a smartphone, and 47.3% of internet users said they use a tablet PC.

Key Finding: Italy has made progressive improvements in both smartphone penetration and 4G investment. The rollout of Italy's 5G network is expected to gain momentum soon.

The Italian state and Italy's payments industry have a clear strategy to modernise the country's banking infrastructure, transforming them into a banking infrastructure fit for the digital economy. In contrast to many other countries, there is a de-facto electronic customer-to-business interaction banking standard, CBI, established by the CBI S.c.p.a. and used by three million companies in Italy.

The ongoing rollout of a mature online and mobile communication infrastructure will act as an enabler for Open Banking.

OPEN BANKING HIGHLIGHTS IN ITALY

The adoption of Open Banking in Italy is gaining momentum among banks and nonbank groups. Not only has Open Banking paved the way for financial technology companies to encroach on certain areas that have traditionally been the preserve of Italy's big banks, but it has also opened the door for non-financial services companies to enter the market for the first time.

After a slow start in 2018, Italian banks engaged strongly to

Italy

develop Open Banking services focused on their consumer and business portfolios by adding new features such as real-time payments linked to electronic invoice services, online cash-pooling, issuing virtual payment cards and instant insurance and lending:

- NEXI and SIA, Italy's largest payment processors, launched instant payment services and Open Banking on behalf of the Italian banks. Other processors supporting Open Banking include CBI Globe, Cedraci and Fabrick.
- Consistent with the provisions of PSD2, Italian banks act as ASPSPs and work with independent PISPs and AISPs using their own API sets to power their service businesses. In addition, Italian banks added account information and instant payment services to their online banking services and mobile banking apps.
- However, bank groups such as Unicredit Group and foreign banks such as ING Group go on their own while other Italian banks follow the cooperative approach via gateways for the banking sector such as NEXI and SIA.
- In parallel, Italian banks have begun to cooperate with select trusted FinTech partners to create added value services which they market together. Selected trusted FinTech partners may include PISPs, AISPs, consumer credit finance partners, personal finance management partners (PFMs), and/or ETF broker advisors.
- Many Italian bank clients can use the account information statements and payment transaction histories from their other bank accounts, with this information aggregated and categorised in real-time at each login. This enables clients to undertake personal finance management by themselves in a single app, or to take advantage of mobile apps from independent PFM service providers.
- In late 2018, utility provider Hera SpA joined forces with UniCredit Bank to provide virtual IBAN-accounts which allow customers to pay their energy bills directly from their online bank account.
- Intesa Sanpaolo SpA, Italy's second-largest bank, launched XME Banks, an account and card aggregator that allows customers to get a single view of all their bank accounts.
- In June 2020, UniCredit Bank launched its own Open Banking-powered account aggregator.
- In September 2020, Iren SpA announced that it was to start offering payment initiation services to its customers, with technology provided by Italian payment processor SIA.
- Enel SpA, a major Italian utility company, announced the launch of a digital banking service in October 2020. The Enel X Financial Services app offers customers payment services and a current account. Enel has ambitions to eventually roll out digital insurance and asset management. Enel's digital banking launch follows its acquisition of a 55% stake in Italian payment processor PayTipper SpA in November 2019, and the announcement of a partnership with Sweden-based Open Banking platform Tink in September 2020.
- In February 2021, Open Banking solution provider Nuapay extended its Open Banking payment services to Italian banks.

Key Finding: By taking advantage of pan-European developments such as PSD2, Italy's banks are progressing towards a full Open Banking environment focused on improving the customer's digital experience. This is particularly significant in the Italian context, where customers are considerably less likely to use digital banking.

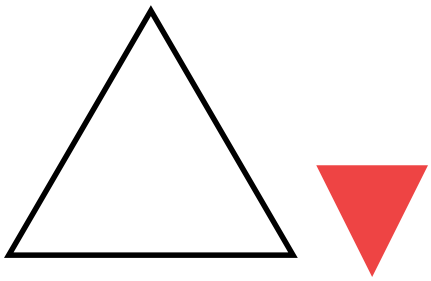
In 2020, many Italian banks have account information and payment initiation services in place. Also, RTS SCA and RTS XS2A requirements have been implemented for digital payment services directly from bank accounts.

In 2020, five PISPs and eight AISPs were granted licenses by Bank of Italy, including well-known players from the card payments industry. In total nine TPPs and as well as 118 foreign TPPs with EU passports can connect to Italian banks via that bank's API set.

Italy provides consistent API access to most Italian banks thanks to having outsourced their requirement to a single aggregator.

In summary, Italian banks have developed a competitive digital banking strategy, and have established a cardless digital payment platform fit for the digital economy.

ITALY



Readiness Index Position

OPEN BANKING READINESS INDEX: CATEGORY 4

Internet Use:

86%
Households with internet access

83%
Last internet use (12 months)

46%
Internet users who bought online

38%
Last online purchase (12 months)

28%
Last online purchase (3 months)

Digital Communication Infrastructure:

Mobile phone subscription:
133.1%
PER CAPITA

Smartphone penetration:
60.8%
OF MOBILE PHONES

4G LTE internet penetration:
79.0%
5G NETWORK LAUNCHED

Digital banking penetration:
39%
OF 14-76 AGED CAPITA

Bank-backed Open Banking Infrastructure:

- Open Banking regulation: PSD2 implemented 2018
- Open Banking licenses: 5 PISPs, 8 AISPs licensed in Italy by AGCM
- Open Banking APIs: Italian banks outsourced API set to one Italian aggregator
- Payment initiation services: mobile payment scheme Bancomat Pay: online, POS, P2P
- Instant payment services: added to digital banking by most Spanish banks
- Instant payment initiation: online: Bancomat Pay, POS: Bancomat Pay, P2P: Bancomat Pay
- Account information services: many banks offer account aggregation, including Intesa Sanpaolo. BPER, UBI Banca, Banca Sella

Case Study

ITALY'S DIGITAL PAYMENT SCHEME BANCOMAT PAY

The Open Banking mandate has had a significant indirect impact on the Italian payments industry. It is a move that could transform the payments space in a country in which the use of cards and digital payments is relatively low.

In parallel to consolidation in the Italian bank sector, Italian banks have accelerated the digitalisation of domestic payment services which promote digital payments directly from bank accounts and mobile P2P payments. Highlights include:

- So far, leading Italian banks offer MyBank and mono-bank online bank transfer services to their online merchants as a competitive option to online payments on cards.
- However, Italian banks collaborate to add a complimentary digital instant payment service, Bancomat Pay, to their domestic debit card, Pagobancomat, which cannot be used for online/ mobile payments.
- In mid-2018, Bancomat S.p.A., the interbank organisation managing the domestic debit card scheme, signed an agreement with SIA, the processor for Italy's mobile immediate payment service Jiffy, to make its POS terminals available to Jiffy app holders. This increased Jiffy's usage profile, given that Bancomat has more than 2.1 million POS terminals (2019) in Italy.
- In August 2018, Bancomat partnered with SIA and introduced Bancomat Pay to provide mobile payments to PagoBancomat cardholders at 440 banks. Bancomat Pay integrated the Jiffy service, enabling PagoBancomat cardholders to make instore, online and P2P payments from their handsets using a mobile phone number.
- In June 2019, the Jiffy mobile payment system was rebranded as Bancomat Pay, becoming the first domestic digital payment scheme in Italy. In the longer term, Bancomat S.p.A. is promising to bring Jiffy to all its 37 million cardholders, through their banks' apps or via the Bancomat Pay app.

Bancomat Pay – In October 2014, the Italian banks and Italian processor SIA launched a new mobile P2P payments service, Jiffy. In 2019, it became rebranded as Bancomat Pay.

Via the Jiffy app, users can send and receive money in real time on their smartphone to and from their contacts. Jiffy is based on the SEPA Credit Transfer payment instrument. From November 2017, Jiffy also uses the SEPA Instant Payment instrument in SCT Inst format as a base. This move has enabled Jiffy for all banks in the Single European Payments Area (SEPA), and it has facilitated inter-bank and cross-border transactions provided that all counterparties have signed up to the Jiffy service.
With Jiffy, it is possible to transfer sums of money to beneficiaries identified by their phone number and the availability of the funds is immediate. In fact, the debit and credit payments are made directly from a current account through a "real time" credit transfer carried out via mobile banking in a totally secure manner.

In 2016, Jiffy was launched as in-store payment service in retail outlets. By the end of 2019, 23 banks representing a market share of about 80% of Italian current accounts have joined the service, and 15 banks operate the service. The average transaction value per payment is around €50, and 40% of P2P transfers are for sums under €25.

From autumn 2019, Bancomat Pay was made available to around 5 million users registered with Jiffy, at over 2,000 outlets, as well as on PagoPA for payments to the Italian public sector. PagoBancomat Pay users can pay in stores and in online shops, as well as sending and receiving money in real time from their smartphone by using their own mobile phone number with P2P, P2B, P2C and P2G services.

MyBank – Leading Italian banks offer online credit transfer services to their online merchants as a competitive option to card payments on the internet. In May 2012, the major Italian banks opted to support the Mybank initiative through EBA Clearing. As an IBAN-based online bank transfer service, MyBank allows Italian bank customers to make cardless online payments directly from bank accounts without the need to provide their payment data to third parties. Italian banks supporting MyBank include Intesa Sanpaolo, UniCredit, Banca Monte dei Paschi di Siena, Banca BPM, Iccrea Banca and Banca Sella, representing 75% of the Italian payments market, in line with the Italian banking community's commitment to roll out MyBank nationally.

MyBank is owned and managed by EBA Clearing subsidiary Preta SAS. MyBank is available to over 30 million retail customers in Italy. It can be used at over 10,000 licensed merchants in Italy, Spain and Greece. MyBank supports SEPA Credit Transfers initiated via online or mobile banking. It also enables customers to create, modify and cancel e-mandates for SDD direct debits. By the end of 2019, goods and services worth more than €15 billion have been paid for with MyBank payments since launch. Amounts paid with MyBank range from €2 to €400,000 and cover a wide range of use cases from B2C and B2B to payments to public administration. Transaction value grew by 50% in just over six months and, concurrently, daily transactions saw a significant increase, reaching an average of €19 million per day.

NORWAY

NORWAY

Overview

As one of the Nordic countries with a well-established online/mobile banking infrastructure, Norway is well prepared for Open Banking. Banks active in the Norwegian market support the pan-Nordic P27 initiative (see above).

Norway has a Nordic collaborative model which has created some of the most successful digital payment wallets and digital ID services. In June 2018, the merger of the three Norwegian domestic payments services (Vipps, BankID and BankAxept) was announced, designed to prepare Norway's domestic payment schemes for the Open Banking ecosystem.

By adding payment initiation and account information cross banks to digital banking and creating the new domestic digital payment scheme, Vipps, Norway's banks used the Nordic collaborative model to transform their proven domestic payment services for Open Banking and the digital economy.

Before implementing PSD2, Norwegian online and mobile banking were already focused on pan-Nordic banking services, credit transfer payment initiation, digital ID authentication and mobile P2P payments. The clearing and settlement of bank payments was executed through Norges Bank's CSM service.

The proven Nordic collaborative model typifies the development of Open Banking in Norway. It may be characterised as successful collaboration between Nordic banks to deliver modern banking and digital payment services for the region.

DIGITAL BANKING INFRASTRUCTURE IN NORWAY

The clearing and settlement of bank payments is executed through Norges Bank's domestic CSM service, or between the Nordic bank groups. For Euro-denominated payments, Norges Bank and the large Nordic bank groups can handle IBAN-based clearing and settlement for retail payments. In September 2017, the Nordic processor NETS delivered mobile instant payments to customers using Vipps.

Norway has high mobile phone penetration and sophisticated internet provision, with almost 95.5% of internet users enjoying 4G internet. The three Norwegian mobile network operators began 5G internet rollout in 2019.

With around 5.77 million active mobile subscriptions, many Norwegians own more than one mobile, and mobile device penetration stands at 107.5%. In 2019, 95% of mobile phone users owned a smartphone, and 72% of Norwegian households said they used a tablet PC.

Key Finding: With 95% of Norwegian adults using online banking and mobile banking, the rollout of digital banking infrastructure in Norway has achieved a high level. In addition, the Norwegian state and Norway's banks have a clear strategy for a pan-Nordic digital banking infrastructure, fit for the Nordic digital economy.

Norway has a high level of both smartphone penetration and 4G internet. The rollout of Norway's 5G network has started slowly. The rollout of a mature online and mobile communication infrastructure will act as a strong enabler for Open Banking.

OPEN BANKING IN NORWAY

Most of the big Nordic Banks have an open banking strategy, but functionality is often limited to viewing accounts and transaction information. Nordea Group and DNB Bank are among Europe's frontrunners in Open Banking.

The eID-compliant digital identity service, BankID, which is specific to Norway, has in itself been a significant driver for digitisation in Norway. It supports authentication and digital signatures in the public sector, the financial sector and for businesses.

PSD2 requires Norwegian banks to offer a technical bank account interface to enable TPPs to offer payment services. These interfaces were expected to be in place by 14 September 2019, but it has taken time for banks to develop interfaces that comply with the regulatory framework, and Finanstilsynet has therefore granted banks the right to establish a fallback for TPPs to access accounts. DNB and other Norwegian banks use now their own Open Banking API sets.

Norwegian banks began to merge their successful payment

Norway

services into a single new interbank organisation, VBB AS:

- BankAxept, the domestic debit card scheme
- BankAxess, the domestic online payment service complimentary to BankAxept
- Vipps, the new domestic digital payment wallet scheme
- BankID, the online identification and digital ID signature service

In November 2017, Norwegian banks agreed to combine their payment units (Vipps, BankAxept and BankID Norge) in a bid to improve their product offering. In June 2018, the Norwegian Ministry of Finance approved the merger between these schemes with DNB Bank taking ownership of 43.9% of the merged entity. The merger became effective from July 2018. The new interbank organisation, VBB AS, is focused on improving the customer experience when paying for goods. Cost efficiency and accelerating innovation are also two big priorities. DNB Bank and Danske Bank also became co-owners of Nordic API Gateway in 2018.

In 2018, Nordic banks began transforming their banking infrastructure for Open Banking:

- Account Aggregation Services – In August 2018, the savings banks Sbanken, Sparebanken Vest and Sparebanken Sogn og Fjordane said they would enable bank clients to view their accounts across all banks inside their own online platform.
- In October 2019, DNB launched a new mobile bank, its multi-cloud solution and a new version of its mobile banking app on the Nordic API Gateway which allowed access to aggregated bank data. Through the Nordic API Gateway, DNB became the first Norwegian bank to gain access to all banks in Norway.
- In February 2020, DNB expanded its account aggregation tool by adding the option of making account-to-account payments from any bank supported by its mobile banking app.
- In May 2020, Nordea announced the addition of Tink's account aggregation and personal financial management technology into its mobile app in Sweden, Norway, Finland and Denmark. The new features will allow app users to have an overview of their finances in one place, including card transactions, mortgages, savings, loans and current accounts including those held with other banks.
- DNB bank and Danske Bank (DK) are bidding to position the Nordic API Gateway as an aggregator for PSD2. In April 2021, Nordic API Gateway changed its name to Aiia.

THE FINANCE INNOVATION ASSOCIATION – DRIVING NORWEGIAN DIGITISATION

In August 2017, more than 20 Norwegian banks and tech companies aligned to create a FinTech hub to push a global innovation agenda amid growing collaboration between banks and start-ups in Norway.

Members of the Finance Innovation Association include Sbanken, Nordea, DNB, Tryg Forsikring, Monobank, Sparebanken Vest, Tripod, Stacc, Knowit and Webstep. Academic partners include the NHH Norwegian School of Economics and the University of Bergen.

The formation of this cluster comes as PSD2 and MiFID II and advanced technologies in the shape of AI and blockchain act as catalysts for new business models and services in the financial sector.

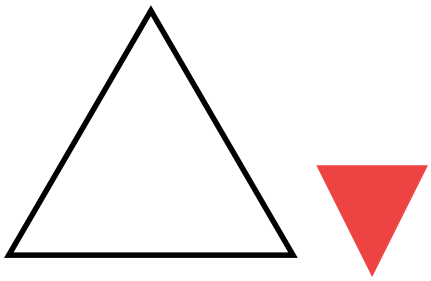
It also taps into Norwegian consumers' healthy appetite for new technology. In Norway, smartphone penetration stands at 95% and 95% of the population use online banking services.

Key Finding: By taking advantage of the Nordic collaborative models and pan-European developments such as PSD2, Norway is transforming its proven payment infrastructure for Open Banking, and has opened its Norwegian mobile payment service scheme, Vipps, to other Nordic bank clients. As a next step in the Norwegian collaborative model, banks active in the Norwegian market support the pan-Nordic P27 initiative and the Nordic KYC Utility provider, Invidem.

Norwegian banks provide Open Banking API access in combination with aggregators, which provide connectivity between Nordic banks and between banks and independent PISP/AISPs. This approach may be a basic step towards a potential future Nordic Open Banking API set as part of a Nordic cross-border payment infrastructure.

In 2020, four PISPs and four AISPs were granted licenses by Finanstilsynet. In total six TPPs and as well as 93 foreign TPPs with EU passports can connect to Norwegian banks via that bank's API set.

NORWAY



Readiness Index Position

OPEN BANKING READINESS INDEX: CATEGORY 1

Internet Use:

98% Households with internet access

99% Last internet use (12 months)

83% Internet users who bought online

82% Last online purchase (12 months)

67% Last online purchase (3 months)

Digital Communication Infrastructure:

Mobile phone subscription:
107.2% PER CAPITA

Smartphone penetration:
95.0% OF MOBILE PHONES

4G LTE internet penetration:
95.5% 5G NETWORK LAUNCHED

Digital banking penetration:
95% OF 14-76 AGED CAPITA

Bank-backed Open Banking Infrastructure:

- Open Banking regulation: PSD2 implemented 2019
- Open Banking licenses: 4 PISPs, 4 AISPs licensed in Norway by Finanstilsynet, 93 TPPs passported
- Open Banking APIs: Open Banking API access model in combination with aggregators
- Payment initiation services: mobile payment scheme Vipps online, POS, P2P
- Instant payment services: will be added to digital banking
- Instant payment initiation: online: Vipps, POS: Vipps, P2P: Vipps
- Account information services: in 2019, DNB Bank was first

NORWAY'S DIGITAL PAYMENT SERVICES: VIPPS, BANKAXESS AND BANKID

Alongside BankAxept, Norway's domestic debit card scheme, there are three proven payment services merged into the new interbank organisation, VBB AS:

- Vipps, the domestic digital payment wallet scheme
- BankAxess, the domestic online payment service complimentary to BankAxept
- BankID, the online identification and digital ID signature service

Vipps: from P2P payment app to Norway's mobile payment wallet in five years

In May 2015, the largest Norwegian bank, DNB, launched a new mobile P2P payment solution, Vipps. In February 2017, the other Norwegian banks joined DNB to make Vipps the 'single Norwegian mobile wallet', and the other bank-backed mobile payment app, mCash, was merged with Vipps. In late 2017, the Vipps service was launched in-store.

In December 2018, Norway's Vipps and Finland's ePassi adopted Alipay's QR-code standard to enable interoperability for their four million mobile wallet users. Under this agreement, consumers can use their home app to scan the QR-code of the partner scheme from 2019. Merchants can accept QR-code payments from domestic customers and use the same unmodified system to welcome payments from other Nordic countries as well as Chinese tourists. As part of this announcement Vipps began the Norwegian roll out of Alipay.

In March 2019, Vipps added new e-invoicing options to its P2P platform via a partnership with NETS. The agreement makes NETS' e-invoicing tool eFaktura available across the Vipps platform. Around 2.6 million use eFaktura, which distributes approximately 100 million invoices each year. This partnership enables consumers to pay all digital invoices and bills in Vipps or through online banking services and mobile banking apps.

In May 2020, Vipps began to roll out its new solution for payments at EFTPOS terminals in retail outlets, with a BankAxept card number or credit card number as the underlying payment technology. When the customer wants to pay with Vipps, a QR code is scanned on the screen, and the payment is made via BankAxept or credit card.

Vipps is based on BankID authentication, mobile payment initiation directly from bank accounts and payments on cards. By using a BankAxept card number or a credit card number, Vipps uses the existing card infrastructure (such as POS terminals and ATMs) creating significant network acceptance. The system is open to all market participants, including other banks and retailers, and supports all transaction types: the purchase of goods and services, ATM withdrawals, e-commerce and P2P money transfers. New legislation requires the authentication of online card payments with BankID. Vipps users can also benefit from immediate payments.

After downloading the Vipps app, there is a one-time onboarding-process. Each user must register a mobile phone number, bank account, digital BankID, credit card or BankAxept debit card, and all must be Norwegian. After registration, the user's account information is connected to the user's mobile phone number. In 2020, the Vipps wallet app supports P2P payments, online payments, QR-code initiated payments in-store, card-initiated payments in-store, e-billing invoice payments in-app and immediate P2P payments.

As of mid-2020, Vipps had over 3.3 million active users with 107,000 active users per day. According to Vipps, 75% of Norwegians have a mobile wallet, everybody has a bank account, and most invoices are electronic.

BankAxess – NETS, the interbank organisation BankAxept and 18 Norwegian banks have developed BankAxess, the online credit transfer service which allows users to pay for online purchases directly from a bank account.

To be granted BankAxess use, account holders need to make an agreement with their bank. Users identify themselves and authenticate payments using the BankID certificate issued by the account servicing bank. BankAxess for use with smartphones was launched in 2013. The service is expected to be replaced by Vipps.

In 2019, there were around 0.1 million BankAxess payments totalling NOK 0.4 billion, flat in terms of payment numbers and down by 33.3% in terms of transaction value compared to 2018.

BankID – this digital ID scheme is offered and issued by Norway's banks. BankID is based on a coordinated infrastructure developed by the banking industry through the interbank organisation, VBB, under the direction of Finansnæringens Fellesorganisasjon (FNO). The first Norwegian customers were issued a BankID in 2004. In 2019, more than four million Norwegians have BankID, and more than 1.6 million have 'BankID on mobile.' BankID is used by all the country's banks, public digital services, and an increasing number of enterprises in different sectors. A total of 800,000 to 900,000 BankIDs are used every day. BankID is used by more than 80% of all adults in Norway. With BankID, enterprises can identify Norwegians digitally. BankID is an important element of the Norwegian payment system and helps banks maintain a high level of security. In June 2016, Norway's BankID said it began a pilot programme to test in-app authentication and biometric logins for one-click access to financial services. New legislation requires the strong customer authentication of Norwegian online payments with BankID. According to Vipps, 90% of Norwegians have a multi-purpose eID, BankID.

POLAND

POLAND

Overview

Poland is Eastern Europe's largest retail banking market, with a well-established online/mobile banking infrastructure. There are two instant payment schemes denominated in Polish Zloty. Historically, Polish banks have developed online banking and Open Banking at the level of individual banks.

With the advent of PSD2, however, Polish banks have made a joint push for digital credit transfer payments and mobile P2P payments. The banks are also collaborating to offer a cardless digital payment scheme known as BLIK.

In 2019, early-mover Polish banks began to add account information services to their individual online banking services and mobile banking apps. From a pan-European perspective, Polish banks have created a best-in-class case study in the domestic BLIK scheme and in-house PISP and AISP services for how to transform domestic payment solutions into omnichannel payment services fit for the digital economy.

Before implementing the revised payment service directive, PSD2, and its Open Banking mandate, Polish online/mobile banking was focused on domestic-banking services. Historically, there were no collaborative, iterative approaches to next-generation payments in the country. The banks adopted their own approaches to the delivery of modern banking and digital payment services. With the advent of PSD2, however, Polish banks have begun to push for digital credit transfer payments and mobile P2P payments.

DIGITAL BANKING INFRASTRUCTURE IN POLAND

The clearing and settlement of bank payments is executed through the bank-backed domestic CSM mechanism, Krajowa Izba Rozliczeniowa (KIR). Its payment gateway processing and CSM services are provided using several electronic clearing systems:

- Elixir – the Polish interbank clearing system for payments denominated in PLN
- Euro Elixir – the Polish interbank clearing system for payments denominated in EUR
- Express Elixir – the Polish instant payment clearing system denominated in PLN
- Paybynet – a system of guaranteed, direct, and fast on-line payments
- Invoobill – the electronic bill presentation and payment system in Poland

Where payments are denominated in Euros, most Polish banks support SEPA credit transfers instruments processed through KIR, the domestic CSM service.

Poland has a high mobile phone penetration and sophisticated internet provision, with almost 83% of internet users enjoying 4G internet. The "5G for Poland" strategy, developed by Poland's Ministry of Digital Affairs, aims for the efficient implementation of a 5G network in Poland that will offer citizens access to the latest technologies while giving Polish entrepreneurs a competitive advantage.

Poland's mobile market is the largest in Central and Eastern Europe. With around 53.0 million active mobile subscriptions, many Poles own more than one mobile, and mobile device penetration stands at 137.9%. In 2019, 75% of mobile phone users owned a smartphone, and 37% of internet users said they use a tablet PC.

Key Finding: Poland has made progressive improvements in both smartphone penetration and 4G investment. The planned launch of Poland's 5G network is expected to start soon. However, there has been notable higher scepticism towards 5G in Poland compared with other European countries.

The Polish state and Poland's payments industry have a clear strategy to modernise the country's banking infrastructure, transforming them into a banking infrastructure fit for the digital economy. The ongoing rollout of a mature online and mobile communication infrastructure will act as an enabler for Open Banking.

OPEN BANKING HIGHLIGHTS IN POLAND

PKO BP is among Europe's frontrunners in Open Banking and has joined the European Payments Initiative (EPI). PSD2 was incorporated into Poland's Payment Services Act (PSA) through the Amending Act of May 10, 2018 that came into force on June 20 2018 and provided for a general transition period until December 20 2018.

- In December 2014, the Polish Financial Supervision Authority, KNF,

had already set new security standards for Polish banks' online payment and mobile systems. The KNF previously asked Polish banks to ensure that their remote payment systems were secured by a strong authentication method such as 3D-Secure or similar, including either permanent or one-time passwords or biometric data.

- In 2015, the leading Polish banks launched mobile HCE NFC payment services as an initial step to transform their banking services into banking infrastructure fit for the digital economy. In 2019, Polish bank clients made more than 57 million mobile HCE NFC payments using solutions such as Apple Pay, Google Pay, Garmin Pay and Fitbit Pay. mBank clients made the most significant number of such transactions at more than 18 million. Santander Bank Polska clients used smartphones and smart watches to make almost 13 million payments, while 11 million payments were made by Bank Millennium customers.
- KIR operates the instant payment system, Express ELIXIR, for immediate credit transfer payments behalf of Polish banks. Blue Media S.A., a Polish FinTech, operates the other immediate payment system in Poland, BlueCash.

In 2017, Polish banks began to embrace Open Banking:

- As an initial step into the world of Open Banking, Polish banks continued their mono-line mobile credit transfer payment apps such as Przelewy24, Inteligo, mBank, Pekao24, Paybynet and PayU Express. They let customers make in-store payments and ATM withdrawals by keying in an app-generated code. Customers can also send money to recipients by entering their mobile phone number. However, no convenient domestic payment initiation service was put in place.
- As a second step, Polish banks joined forces to launch a new domestic mobile credit transfer payment scheme, BLIK, which has a unique, co-operative model between Polish banks, payment acquirers and merchants. Built on a partnership between Poland's largest banks, the BLIK payment scheme supports a single, integrated platform across all mobile devices. Polish Payment Standard Ltd. (Polski Standard Platnosci) operates the BLIK mobile payment system (see below).
- As the next step towards Open Banking, Polish banks have opted for a new domestic Open API standard, PolishAPI, which is seen as a key part of Open Banking in the Polish financial market. Polish API is one standard, but there are different understandings and applications of Polish API among the country's banks.
- In 2019, ING Bank Śląski was the first Polish bank to enable customers to view accounts from other banks in a single app. This new in-house AISP solution was implemented in the "Moje ING" online and mobile banking systems. The other Polish banks are expected to follow suit.
- In March 2021, only Millennium Bank, ING Slaski and Alior Bank offer their own PISP services compliant with the PSD2. So far, the other Polish banks continue to use the so-called PayByLInks service providers. According to KNF, screen scraping is an illegal activity in Poland, thus excluding its use as a temporarily MCI.
- **Outlook:** Polish banks will add account information services and instant payment services to their online banking services and mobile banking apps. All Polish bank clients can use the account information statements and payment transaction histories from their other bank accounts, with this information aggregated and categorised in real-time at each login. This enables clients to undertake personal finance management by themselves in a single app, or to take advantage of mobile apps from independent PFM service providers.

KNF's specific interpretation of banking outsourcing: On September 16, 2019, the Polish Financial Supervision Authority, KNF, published its position on selected issues related to the EBA Guidelines (EBA/GL/2019/02) on outsourcing, which entered into force on September 30, 2019. KNF expects supervised entities to comply with EBA guidelines by June 30, 2020 at the latest.

Although the position is addressed primarily to banks, as it refers to the question of the permissible scope of delegation of banking activities within the meaning of the Polish Banking Law Act of August 29, 1997, it is desirable, in the opinion of the KNF, that payment institutions – as it were, by analogy – consider the position of the KNF in the scope in which they may be affected. In the opinion of KNF, the new types of payment service providers shall consider by analogy the position of KNF in the scope of their services.

Key Finding: By taking advantage of pan-European developments such as PSD2, Poland's progress towards a full Open Banking environment has gained momentum. According to market experts, however, KNF's specific interpretation of its banking outsourcing regulations may be a constraint on Poland's Open Banking development.

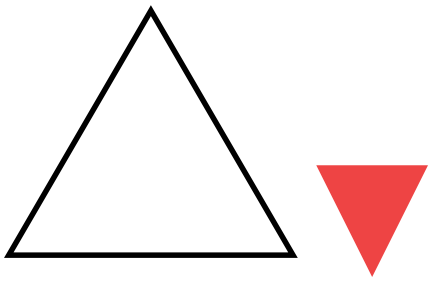
However, drivers for the delivery of further Open Banking payment services are in place, including the new domestic API standard, PolishAPI, immediate payment services denominated in PLN, and the fast-growing domestic mobile credit transfer payment service, BLIK.

In 2020, six PISPs and 10 AISPs were granted licenses by KNF, including well-known players from the card payments industry and PayByLink providers such as BlueMedia. In total twelve TPPs and as well as 108 foreign TPPs with EU passports can connect to Polish banks via that bank's API set.

From a pan-European point of view, Polish banks have created a best practice model with the domestic BLIK scheme and in-house PISP and AISP services for the transformation of domestic payment solutions into omnichannel payment services fit for the digital economy.

In summary, Polish banks have developed a competitive digital banking strategy, and established a cardless digital payment platform fit for the digital economy. However, there are different understandings and applications of the Polish API standard among the country's banks.

POLAND



Readiness Index Position

OPEN BANKING READINESS INDEX: CATEGORY 4

Internet Use:

87%	88%	61%	54%	41%
Households with internet access	Last internet use (12 months)	Internet users who bought online	Last online purchase (12 months)	Last online purchase (3 months)

Digital Communication Infrastructure:

Mobile phone subscription:	Smartphone penetration:	4G LTE internet penetration:	Digital banking penetration:
138.0% PER CAPITA	64.0% OF MOBILE PHONES	82.9% 5G NETWORK LAUNCHED	49% OF 14-76 AGED CAPITA

Bank-backed Open Banking Infrastructure:

• Open Banking regulation:	PSD2 implemented 2018 into Polish law: Payment Services Act (PSA)
• Open Banking licenses:	6 PISPs, 10 AISPs licensed in Poland by KNF, 108 TPPs passported
• Open Banking APIs:	PolishAPI standard, but different interpretations by Polish banks
• Payment initiation services:	per mono-line bank app, also online: BLIK, POS: BLIK, P2P: BLIK
• Instant payment services:	will be added to digital banking
• Instant payment initiation:	online: BLIK, POS: BLIK, P2P: BLIK
• Account information services:	in 2019, ING Bank Śląski was first

Case Study

POLISHAPI AND BLIK, THE DOMESTIC MOBILE PAYMENT SCHEME

In November 2017, the BLIK mobile payment system became the first domestic digital payment scheme in Poland. It became the second most popular online payment method after cards.

BLIK has a unique domestic model of co-operation between Polish banks, payment acquirers and merchants. Built on a partnership between Poland's largest banks, BLIK supports a single, integrated platform across all mobile devices.

With the growth of its acceptance network, BLIK allows users to pay online, mobile, at ATMs, in-store, at retail outlets, post offices, local administration offices and various online payment service processors which service online merchants.

PolishAPI – The new PolishAPI standard is the Polish payments industry's response to the need to accelerate financial innovation in Poland. PolishAPI also aims to reduce implementation costs for payment institutions, PISPs, AISPs and other third parties. Project participants include the Polish Bank Association, together with commercial and cooperative banks, cooperative savings and credit unions (SKOK), the Polish Organisation of Non-banking Payment Institutions (PONIP), as well as associate members, the Polish Chamber of Information Technology and Telecommunications (PIIT), the Polish Insurance Association (PIU), Krajowa Izba Rozliczeniowa, Biuro Informacji Kredytowej, and Polski Standard Płatności (operator of BLIK).

BLIK is based on one-time six-digit codes generated by users in the mobile banking app and non-card mobile payments directly from bank accounts. BLIK uses the existing card infrastructure (such as POS terminals and ATMs), to create the immediate benefit of significant network acceptance. The system is open to all market participants, including other banks and retailers, and supports all transaction types: the purchase of goods and services, ATM withdrawals, e-commerce and P2P money transfers.

In 2019, there were 31 direct participants in the BLIK payment scheme, including 11 of the country's top retail banks. BLIK is available at more than 476,200 retail service points, 538,400 POS terminals, 110,300 e-commerce stores and 20,000 ATMs.

In 2020, Poles made 423.9 million online and POS payments, withdrawals from ATMs and P2P money transfers to a mobile number for a total value of PLN 56.8 billion. BLIK has seven million active users equivalent to 18.2% of the Poles.

SPAIN

SPAIN

Overview

Prior to implementing PSD2 and its Open Banking mandate, Spanish online/mobile banking was focused on domestic-banking services. The banks adopted their own approaches to the delivery of modern banking and digital payment services.

With the advent of PSD2, however, Spanish banks merged their three domestic card schemes, implemented instant payments services, and have begun to push for digital credit transfer payments and mobile P2P payments.

By adding payment initiation and account information cross banks to digital banking and creating a mobile digital payment scheme, Bizum, Spanish banks are transforming their proven domestic payment services to make them fit for Open Banking and the digital economy.

Spain's iterative approach to next-generation payments by bank group typifies its development of Open Banking. Spain's approach may be characterised as successful cross-industry collaboration taking advantage of pan-European developments like PSD2 and SCT Inst to deliver modern banking and digital payment services.

DIGITAL BANKING INFRASTRUCTURE IN SPAIN

Banco de España (BDE) and the country's large banking groups can handle the IBAN-based clearing and settlement of retail payments. The clearing and settlement of bank payments is executed through the CSM service of Banco de España's CSM processor Iberpay. Since 2018, Spain's clearing and settlement mechanisms support instant payment services, such as EBA CLEARING RT1.

In November 2017, the Spanish CSM processor, Iberpay, said it was ready to connect Spanish banks to the EBA Clearing system for their cross-border euro real-time payments in preparation for the launch of the SCT Inst scheme. In November 2020, Iberpay reported that the Spanish Retail Payment System (SNCE), managed by Iberpay, had broken its own record by processing over one million instant credit transfers per day (SCT-Inst), with a total value of €480 million.

Instant credit transfer volumes in the SNCE represented a 28.4% share of total credit transfers (SCT-Inst) processed, against a 7.5% share in Europe estimated by the EPC. Some Spanish banks already process over 60% of their credit transfers by means of SCT-Inst.

As of 2020, 93 Spanish banks participate in Iberpay's instant payment services, representing over 97% of the Spanish payments market. Iberpay also connects nearly all its participants to EBA Clearing's RT1 service and to the Eurosystem's TIPS service, guaranteeing access to more than 2,500 banks in Europe to send and receive instant payments.

Spain has a high mobile phone penetration and sophisticated internet provision, with almost 87.4% of internet users enjoying 4G internet. In 2020, Spanish mobile network operator Telefonica said its 5G internet covers 76% of the population.

With about 55.7 million active mobile subscriptions, many Spaniards own more than one mobile, with 118.3 percent mobile device penetration. In 2019, 72.5% of mobile phone users own a smartphone, and 43% of internet users said they use a tablet PC.

Key Finding: The rollout of digital banking infrastructure in Spain has achieved a high level. The rollout of 5G internet has been particularly impressive, covering 76% of the population. The country's mature online and mobile communication infrastructure will act as an enabler for Open Banking.

OPEN BANKING HIGHLIGHTS IN SPAIN

BBVA, Banco Santander, Bankia and Caixabank are among Europe's frontrunners in Open Banking. Ahead of PSD2 in 2017, Spanish banks began transforming their banking infrastructure for Open Banking:

- In May 2017, early mover BBVA launched its Open Banking marketplace by making eight of its APIs commercially available for the first time, meaning that trusted TPPs including FinTech start-ups and developers are able to build new products and services by accessing and integrating BBVA customers' banking data into their applications. BBVA's Spanish API store offers multiple APIs including retail account data, payment initiation and card purchase data.
- **Sistema Pay –** As part of their digital transformation strategy, the Spanish banks decided to merge the three domestic card schemes in Spain. In February 2018, Sistema Pay absorbed Euro 6000, ServiRed

Spain

and Sistema 4B. With the advent of PSD2, the three domestic card schemes were merged to become a new Spanish domestic card scheme managed by one card association, Sistema de Tarjetas y Medios de Pago, known as SistemaPay. The Sistema card scheme is supported by Banco de Espana and 34 large Spanish member banks, which were already members in at least one of the domestic schemes. The members also opted to transfer the three ATM network processing service to the new entity, SistemPay.

- In September 2018, BBVA was the first Spanish bank to launch its own AISP service. BBVA customers in Spain can now use the bank's mobile app to view a host of products held with other providers.
- Consistent with the provisions of PSD2, Spanish banks act as ASPSPs, offer account information and payment initiation services, and work with independent PISPs and AISPs, which use the bank's API set to power their own AIS and PIS service business.
- Spanish bank account holders can use the account information statements and payment transaction histories from their other bank accounts, with this information aggregated and categorised in real-time at each login. This enables clients to undertake personal finance management by themselves in a single app, or to take advantage of mobile apps from independent PFM service providers.
- In parallel, Spanish banks began trial cooperations with select trusted FinTech partners to create added value services which they market together. Such partners may include PISPs, AISPs, consumer credit finance partners, personal finance management partners (PFMs), and/or ETF broker advisors.
- In September 2019, the global technology company, Indra, acquired the second largest Spanish AISP/PISP player, Afterbanks. In November 2020, Sweden-based Open Banking platform Tink completed the acquisition of Spanish account aggregation provider Eurobits.
- In November 2020, Spain passed a new law relating to the digital transformation of its financial system. The law introduces the regulatory sandbox: a testing space that can be used to try out technological innovation in financial services under special flexible rules. The aim is to curb costs and regulatory complexity, while ensuring supervision by regulators and due protection for the market. Bankia was the first to submit a test case in API Sandbox based on Open Banking (blockchain).

Key Finding: With the advent of PSD2, Spanish banks are transforming their proven payment infrastructure for Open Banking, with the merger of three domestic card schemes, and the launch of the new domestic immediate payment scheme, Bizum.

Spanish banks claim to be at the forefront of Open Banking. In 2020, account information and payment initiation services have been put in place. Also, RTS SCA and RTS XS2A requirements have been implemented for digital payment services directly from bank accounts.

In 2020, eight PISPs and eight AISPs were granted licenses by CNC, the Spanish financial market regulator, including well-known players from the card payments industry. In total eight TPPs and as well as 115 foreign TPPs with EU passports can connect to Spanish banks by using that bank's Open Banking API set.

Spain provides consistent API access to most Spanish banks thanks to having outsourced their requirement to a single bank serving aggregator. The Open Banking hub of payment processors Redsys provides a Spanish Open Banking API based on the Berlin Group's NextGenPSD2 standard.

SPAIN

Readiness Index Position

OPEN BANKING READINESS INDEX: CATEGORY 3

Internet Use:

95%	93%	62%	58%	47%
Households with internet access	Last internet use (12 months)	Internet users who bought online	Last online purchase (12 months)	Last online purchase (3 months)

Digital Communication Infrastructure:

Mobile phone subscription:	Smartphone penetration:	4G LTE internet penetration:	Digital banking penetration:
118.3% PER CAPITA	72.5% OF MOBILE PHONES	87.4% 5G NETWORK LAUNCHED	62% OF 14-76 AGED CAPITA

Bank-backed Open Banking Infrastructure:

- Open Banking regulation: PSD2 implemented 2018
- Open Banking licenses: 8 PISPs, 8 AISPs licensed in Spain by CNC, 115 TPPs passported
- Open Banking APIs: Spanish banks outsourced the API set to one Spanish aggregator
- Payment initiation services: mobile payment scheme Bizum: online, POS, P2P
- Instant payment services: added to digital banking by most Spanish banks
- Instant payment initiation: online: Bizum, POS: Bizum, P2P: Bizum
- Account information services: all banks offer account information services

SPAIN'S IMMEDIATE PAYMENT SCHEME BIZUM

Leading Spanish banks have offered mono-bank online bank transfer services to their online merchants as a competitive option to online payments on cards. In October 2016, 31 Spanish banks teamed up to launch a new mobile payment platform, Bizum, which replaced other mono-bank payment initiatives such as iupay, Yaap and Mybank.

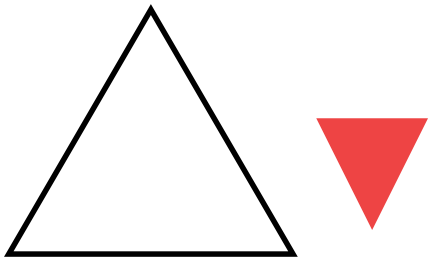
In November 2017, the Spanish CSM processor, Iberpay, connected Spanish banks to the EBA Clearing system for their cross-border euro payments using the SEPA instant payment format.

Immediate Payments with Bizum, the mobile P2P money transfer app, enhanced the mobile banking apps of Spanish banks. Bizum is a digital initiative led by the BDE, the Spanish central bank, and the Government in partnership with Spain's banks. Bizum aims to address evolving customer needs, and it has the support of the banking associations AEB ECSC and UNACC.
This mobile payment app allows users to connect a bank account to the Bizum service and transfer money for free and in real time using their smartphones or tablets. Instant mobile payments can be made in-store, online and between friends, although free person-to-person transfers are limited to ten a month.

Some 28 of Spain's leading banks offer the service, which will be added to the mobile apps of 96% of the country's banks. In 2019, Bizum had over four million registered users and processed 64% of Iberpay transfers in number and 7% in value. Bizum claims it already has more than 14 million users and has processed 318 million operations since its launch.

SWEDEN

SWEDEN



Overview

As one of the Nordic countries with a well-established online/mobile banking infrastructure, Sweden is well prepared for Open Banking. Swedish banks support the pan-Nordic P27 initiative (see above). GetSwish is the interbank organisation managing the immediate payment scheme, Swish.

By adding payment initiation and account information cross banks to digital banking and creating the domestic digital payment scheme, Swish, Sweden's banks are using their Swedish collaborative model approach to transform their proven domestic payment services into an infrastructure fit for Open Banking and the digital economy.

Before implementing PSD2, Swedish online/mobile banking was already focused on Nordic banking services, credit transfer payment initiation, digital ID authentication and mobile P2P payments. The settlement of bank payments was executed through Sveriges Riksbank's CSM service, RIX, whereas Bankgirotcentralen and Postgirot are the clearing houses. The real-time settlement service RIX-INST will be operational in 2022.

The successful development of Open Banking in Sweden benefited from the collaboration between Nordic banks that delivered modern banking and digital payment services for the region.

DIGITAL BANKING INFRASTRUCTURE IN SWEDEN

The clearing and settlement of bank payments is executed through the domestic CSM service of Sveriges Riksbank or between the Nordic bank groups. For Euro-denominated retail payments, Sveriges Riksbank and the large Nordic bank groups can handle IBAN-based clearing and settlement. Since 2012, Swedish banks offer digital A2A payments to bank clients using online banking services, mobile banking apps and Swish.

In April 2020, Riksbank and the ECB concluded an agreement on the settlement of electronic payments in Swedish krona on the Eurosystem's real-time infrastructure, TARGET Instant Payment Settlement (TIPS). The aim is to implement the TIPS platform in RIX in 2022, and a new settlement service for instant payments will be a part of RIX. Payments will be cleared under the agreement as of May 2020. The average number of instant payments in Sweden is 1.7 million per day accounting for more than 618 million in 2020.

Sweden has high mobile phone penetration and sophisticated internet provision, with almost 91.1 percent of internet users enjoying 4G internet. Five Swedish mobile network operators began the roll out of 5G internet in 2020.

With around 13.0 million active mobile subscriptions, many Swedes own more than one mobile, and mobile device penetration stands at 126.3%. In 2019, 92% of mobile phone users owned a smartphone. Also, tablet penetration has jumped significantly, with 5.86 million tablet users in 2019, or 70% of the Swedish population.

Key Finding: With 8.7 million Swedes using online banking and mobile banking, the rollout of digital banking infrastructure in Sweden has achieved a high level. Swedes are tech savvy, and they can buy more or less anything in the country using a card or the mobile Swish app. Moreover, new digital banking services aregrowing rapidly, such as mobile payment services, e-ID authentication and e-invoices.

Sweden has a high level of both smartphone penetration and 4G internet. The rollout of Sweden's 5G network has started slowly. The rollout of a mature online and mobile communication infrastructure will act as a strong enabler for Open Banking.

OPEN BANKING HIGHLIGHTS IN SWEDEN

In 2018, Swedish banks began to transform their banking infrastructure for Open Banking:

- Consistent with the provisions of PSD2, Swedish banks now act as ASPSPs and work with independent PISPs and AISPs using a bank's API set to power their own service business. Aggregators such as Aiia and Mastercard Payments Services offer their Open Banking API sets to connect Nordic banks with each other and with independent PISPs and AISPs.
- In April 2018, Swedbank invested €3 million in a personal finance management and data aggregation platform, Meniga, which commenced roll out to customers in Sweden and the Baltic countries. Meniga, founded in Iceland in 2009, works with banks in 18 markets, including Santander, Intesa, ING Direct, Commerzbank and mBank to make sense of their customers' data and offer more compelling online and mobile banking products.

Sweden

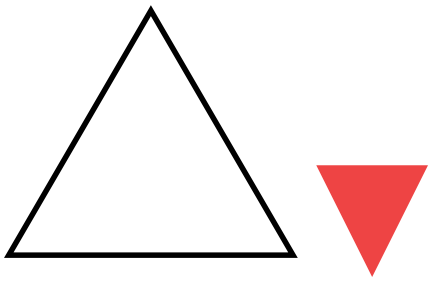
- In May 2018, the Swedish FinTech Open Payments launched a PSD2-compliant aggregator platform that offers users a single, open and secure point of access to the diverse bank API sets throughout the EU.
- Account Aggregation Services – In January 2018, Danske Bank in Sweden revamped its mobile app to allow Nordic customers to view data from their accounts with other providers. From April 2018, Swedish customers were able to gather payment and bank details from all the banks they use and view this in a single app. Denmark, Norway and Finland followed later in the year.
- The Swedish Open Banking platform Tink aims to become the preferred pan-European provider of digital banking services and has increased its local presence across the region. As of 2019, its open banking platform is live in 12 European markets and connects to more than 2,500 banks that reach more than 250 million bank customers across Europe. In June 2020, Tink raised an undisclosed amount of strategic funding from PayPal followed by a further fund raise in late 2020.
- In May 2020, Nordea announced the addition of Tink's account aggregation and personal financial management technology to its mobile app in Sweden, Norway, Finland and Denmark. The new features will give app users an overview of their finances in one place, including card transactions, mortgages, savings, loans and current accounts, including those with other banks.
- In August 2020, Danske Bank launched a new mobile solution that enables their customers to transfer money through Danske Mobile Banking from payment accounts that customers have with other banks. The new solution is carried out via the Nordic API Gateway platform, which has combined access to all Nordic banks' data in one place. In April 2021, Nordic API Gateway changed its name to Aiia.
- Swedish bank account holders can now use account information statements and payment transaction histories from their other bank accounts, with this information aggregated and categorised in real-time at each login. This enables clients to undertake personal finance management by themselves in a single app, or to take advantage of mobile apps from independent PFM service providers such as Spiir or Tink.
- The large Swedish banks have their own Open Banking API sets at a group level. Aggregators such as Aiia, Swedish FinTech Open Payments and Mastercard Payments Services offer their Open Banking API set to connect Nordic banks with each other and with independent PISPs and AISPs.
- In November 2020, Sweden-based Open Banking platform Tink completed the acquisition of Spanish account aggregation provider Eurobits.

Key Finding: By taking advantage of the Nordic collaborative models and pan-European developments such as PSD2, Sweden is transforming its proven payment infrastructure for Open Banking and developing its Swedish mobile immediate payment service scheme, Swish. As a next step in the Swedish collaborative model, Swedish banks support the pan-Nordic P27 initiative and the Nordic KYC Utility provider, Invidem.

Swedish banks provide Open Banking API access in combination with aggregators, which provide connectivity between Nordic banks and between banks and independent PISP/AISPs. This approach may be a basic step towards a potential future Nordic Open Banking API set as part of a Nordic cross-border payment infrastructure.

In 2020, there were 14 payment initiation providers and 28 AISPs licenced in Sweden by Finansinspektionen, including Trustly, Klarna, Open Payments, Tink and Minna Technologies. In total 31 TPPs and 105 foreign TPPs with EU passports can connect to Swedish banks via that bank's API set.

SWEDEN



Readiness Index Position

OPEN BANKING READINESS INDEX: CATEGORY 1

Internet Use:

96%	98%	84%	82%	70%
Households with internet access	Last internet use (12 months)	Internet users who bought online	Last online purchase (12 months)	Last online purchase (3 months)

Digital Communication Infrastructure:

Mobile phone subscription:	Smartphone penetration:	4G LTE internet penetration:	Digital banking penetration:
126.3% PER CAPITA	92.0% OF MOBILE PHONES	91.1% 5G NETWORK LAUNCHED	85% OF 14-76 AGED CAPITA

Bank-backed Open Banking Infrastructure:

- Open Banking regulation: PSD2 implemented 2019
- Open Banking licenses: 14 PISPs, 28 AISPs licensed by Finanstilsynet (S), 105 TPPs passported
- Open Banking APIs: Open Banking API access model in combination with aggregators
- Payment initiation services: mobile payment scheme Swish online, POS, P2P
- Instant payment services: will be added to digital banking
- Instant payment initiation: online: Swish, POS: Swish, P2P: Swish
- Account information services: in 2019, Danske Bank and Nordea were first

Case Study

SWEDEN'S IMMEDIATE PAYMENT SERVICE SWISH + BANKID AUTHENTICATION

In December 2012, a consortium of Swedish banks launched the immediate payments service Swish operated by Getswish AB. Bankgirot provides clearing (part Bankgirot and part Swish) while BIR (owned by Bankgirot) is the settlement facilitator. TietoEVRY is responsible for operations and is developing Swish on behalf of Getswish AB.

Swish includes a mobile payment app which enables private individuals to send money to other users in real time by connecting mobile phone numbers to bank accounts. To use the service, individuals need a smartphone, a secure Swedish mobile BankID and the mobile Swish app. If the recipient's phone has the Swish app, a notification is displayed within a few seconds. The maximum amount varies by bank, but is often SEK 10,000, which can be increased.

In January 2016, Swish for Commerce was launched. There are now three solutions for immediate payments: Swish Private (P2P payments), Swish Business (C2B payments from a person to a company, association or organisation), and Swish for Commerce (for e-commerce and m-commerce transactions).

From January 2017, QR-code initiated in-store payments are available to all Swish users. When a QR-code is scanned, the payment information is filled out automatically and only needs to be approved by Mobile BankID. In June 2019, Swish trialled Bluetooth BLE checkout technology at Swedish restaurants.

In 2019, 7.53 million Swedes used Swish, making it the preferred online payment service for Swedes aged 18-40.

In 2019, based on Riksbank figures, there were an estimated 529 million Swish payments, up by 90.97% on 2018. In 2019, the total Swish payments value amounted to more than SEK 254 billion, and there were on average 51.2 Swish payments per capita. As of 2019, Swish comprised around 6% of total cashless payments in Sweden by number and 1% by value.

BankID is an important element of the Swedish payment system and helps banks to maintain a high level of security. Although the BankID online identification and signature service was developed for banks, it is also used to log in to several public service portals and for online purchases from non-financial firms.

BankID is owned by seven banks: Danske Bank, Handelsbanken, Länsförsäkringar, SEB, Swedbank, Ikano Bank and Skandiabanken. All of them and Forex Bank issue BankID electronic identifications. However, Ikano Bank does not offer BankID directly.

The BankID network infrastructure includes Danske Bank, Forex Bank, ICA Banken, Ikano Bank, Länsförsäkringar Bank, Nordea, SEB, Skandiabanken, Sparbanken Syd, Svenska Handelsbanken, Swedbank, and Ålandsbanken.

Most of these banks also use BankID for electronic identification and e-signing at their digital banks. Including Nordea since 2011, a total of 8 million Swedish citizens can use BankID to secure online banking services and mobile banking apps.

BankID uses a combination of hardware-based authentication (key fobs) and one-time-password generation for authentication. In the mobile environment, Mobile BankID is stored on a smartphone. BankID on card requires a card reader with a card connected to a PC. Users can set up a personal password linked to their BankID and use the same password every time to authenticate for a service. The mobile version is more frequently used. In addition, it is required for Swish.

In November 2017, Nordea launched an e-invoicing service that enables consumers to post invoices and pay their bills via Facebook Messenger. The service, which requires a BankID and mobile security PIN, is fully automated and the payment is initiated via an online dialogue with a chatbot in Facebook Messenger.

THE UK

THE UK

Overview

HM Treasury, the Competition and Markets Authority (CMA) and the Open Banking Implementation Entity (OBIE) are driving the country's shift to Open Banking. The UK market is at the forefront of Open Banking, having set its own framework and API standard.

Following the HM Treasury regulation of 2015, the nine leading UK banks were the first to implement Open Banking APIs. By adding payment initiation and account information across banks to digital banking and creating mobile digital payment schemes, UK banks are transforming their proven domestic payment services to make them fit for Open Banking and the digital economy.

As in the Nordic countries, the British have embraced the use of online banking. According to Eurostat, 78% of British citizens over the age of 15 used online banking services in 2019. At €200 billion, the UK is the largest e-commerce market in Europe.

A 2020 report from UK Finance noted that nearly 10 million people, or 18% of the UK adult population, registered for mobile payments in 2019. 79% of these registered users recorded making a payment.

In 2019, the number of people using online banking services or mobile banking apps continued to grow. Over two-thirds of UK adults (72%) used online banking and over half (50%) used mobile banking. Also in the report, the number of remote banking payments processed via the Faster Payments Service (or cleared in-house by banks) during 2019 increased by 24% to nearly 2.5 billion.

Another report from Insider Intelligence found that 68% of all UK respondents surveyed use mobile banking. Of those that use mobile banking, 86% said mobile was their primary banking channel and 62% said they would change banks if the mobile banking experience fell short.

Secure Biometric Banking – From September 2014, Barclays provided its UK corporate banking customers with finger vein biometric authentication devices that enabled them to easily access their online bank accounts and authorise payments within seconds, without the need for PIN, passwords or authentication codes. The VeinID devices manufactured by Hitachi can read and verify the users' unique vein patterns in their finger. Barclays rolled out the service to its corporate customers from 2015. In September 2016, Lloyds launched biometric fingerprint authentication for its mobile banking app.

Key Finding: Before the CMA's Open Banking commitments and the implementation of PSD2, UK online and mobile banking was already focused on digital banking services, mobile credit transfer payment initiation and mobile P2P payments. The clearing and settlement of bank payments was executed through the Bank of England's CSM services, CHAPS, BACS, Link and Faster Payments.

With the advent of the CMA's Open Banking commitments and PSD2, the UK has begun an iterative approach to next-generation payments that typifies the development of Open Banking in the country. The Digital Strategy, unveiled in March 2017 by the Secretary of State for Culture, Media and Sport, aims to bridge the national digital divide and re-equip the country as a leading international tech hub.

DIGITAL BANKING INFRASTRUCTURE IN THE UK

The clearing and settlement of bank payments is executed through the domestic CSM service of the Bank of England, or between the larger UK banking groups. In the case of Euro-denominated retail payments, the Bank of England and the large UK banking groups can handle IBAN-based clearing and settlement.

Faster Payments is the UK's 24/7 immediate payments service for the same-day processing of payments initiated over the internet or by telephone (see below).

British consumers are tech savvy, and they can buy more or less anything in the country using a card or mobile payment apps such as Paym and Pay by Bank App (previously ZAPP).

Online invoicing and bill presentation and payment services are available from the UK's leading banks. Under a framework established by Pay.UK, Mastercard's Vocalink business and other providers launched Request to Pay bill payment services in the UK. Request to Pay provides the UK market with a secure messaging channel between billers and consumers to send and receive bill payment requests and make payments.

The UK

The UK has high mobile phone penetration and sophisticated internet provision, with almost 91.1 percent of internet users enjoying 4G internet. The mobile network operators in the UK began 5G internet rollout in 2019. By the end of 2020, 5G internet was available in 300 towns and cities with an estimated penetration of around 10%.

With around 79.2 million active mobile subscriptions, many British citizens own more than one mobile, and mobile device penetration stands at 118.4%. In 2019, 82.9% of mobile phone users owned a smartphone. Also, tablet penetration has jumped significantly, with 5.86 million tablet users in 2019 equivalent to 54.0% of UK households.

Key Finding: With 52.1 million consumers using online banking and mobile banking, the roll out of digital banking infrastructure in the UK has achieved a high level. In addition, the UK government and the UK's banks have a clear strategy for a UK digital banking infrastructure fit for the digital economy. Cardless mobile payment services are based on the Faster Payments Scheme, the UK immediate payment system. The UK has a high level of both smartphone penetration and 4G internet. The rollout of 5G networks in the UK has gained momentum. The rollout of a mature online and mobile communication infrastructure is a strong enabler for Open Banking.

OPEN BANKING IN THE UK

In 2015, HM Treasury announced its commitment to deliver an Open Banking API standard for UK banking. In 2016, following an investigation into UK banking, the Competition and Markets Authority (CMA) mandated the nine leading banks to offer Open Banking APIs by January 2018. The Open Banking Implementation Entity (OBIE) was created to deliver Open Banking in the UK.

Since it was launched in 2016, the Financial Conduct Authority (FCA)'s domestic regulatory sandbox has been used by more than 70 firms to test their innovation with real customers in the live market under controlled conditions. Following a trial period, the FCA opened a global regulatory sandbox in January 2019, alongside 20 other regulators from around the world, including the USA, Canada and Australia. These regulators have formed the Global Financial Innovation Network (GFIN), with more than 60 member organisations. This will enable firms to test innovative financial products, services, business models or regulatory technology across more than one country or jurisdiction.

In September 2017, the FCA published its PSD2 Policy Statement which explains the areas of business impacted by PSD2. The FCA also published its Approach Document, designed to help firms navigate the payment services and e-money regulatory requirements, including those set out in HM Treasury regulations.

The UK has created successful digital payment services alongside card payments and credit transfer services. From 2018, many UK banks have an open banking strategy, with functionality initially limited to viewing accounts and transactions. HSBC, RBS, Lloyds Bank, Barclays Group and UK digital challenger banks are among Europe's frontrunners in Open Banking.

PSD2 and HM Treasury regulations require UK banks to offer a technical bank account interface to enable TPPs to offer payment services. UK banks must comply with OBIE's requirements, TPPs must use OBIE standard APIs, and an MCI is not an option in the UK. Starting in 2017, the Government, the CMA and UK banks had begun to transform their banking infrastructure for Open Banking:

- In May 2017, early mover Barclays opened an innovation centre in London housing internal banking and technology teams alongside more than 40 FinTech start-ups. From September 2018, Barclays introduced a feature allowing customers to view current accounts from several other banks within its mobile app.
- In July 2017, Open Banking UK (OBIE) launched its Account Information API and Payment Initiation API specifications. Open Banking UK's API sets became the new Open Banking API standard in the UK. In November 2017, the UK's Open Banking project was expanded to embrace all payment account types – including credit cards, prepaid cards and online wallets – covered by PSD2.
- From September 2017, HSBC allowed customers to view aggregated accounts from multiple banks in one app. Participating users can add accounts from up to 21 different banks, including Barclays, Lloyds and Bank of America. The app shows both assets and liabilities, allowing customers to view how much money is coming in and how much is going out. When a new account is added, login details for each account are tailored to that bank's interface.
- With the core set of requirements in force from January 2018, the CMA and HMS Treasury are already looking ahead to expanding the project to let bank customers using credit cards, e-wallets and prepaid cards take advantage of open banking services through a programme of releases over the next two years.
- The first Open Banking APIs were implemented by banks in January 2018, with TPPs appearing in the market soon after and making significant progress in 2019. The CMA was responsible for establishing the legal framework and the OBIE was mandated to ensure Open Banking's effective implementation in the UK. This coincided with the introduction of the Second Payment Services Directive (PSD2) across Europe.
- In January 2018, four of the CMA9 banks implemented the first APIs and made account data available, with TPPs appearing in the market soon after and making significant progress in 2019. The remaining five CMA9 banks complied in September 2018.
- In September 2018, the mobile money app provider, Yolt, claimed to be the first TPP to successfully complete Open Banking API connections under the new Open Banking regulation with the CMA9 banks. Yolt claimed that its Open Banking app store currently houses more than 80 mobile apps and online products.
- In early 2019, Lloyds Banking Group adopted Open Banking and allowed its customers to see current accounts from other providers within its app. It also claimed to be first to release credit card and savings aggregation in its mobile apps across all three brands (Lloyds, Halifax and Bank of Scotland) using Open Banking.
- From March 2019, NatWest followed in the footsteps of Barclays, Lloyds and HSBC in launching an AISP service for customers to view balances and transactions from other banks on a single screen.
- In June 2020, OBIE launched the Open Banking App Store to help

individuals and companies find the right open banking-enabled financial products for them. The app store currently lists 96 apps and services which are live to market.

- According to OBIE data from April 2021, there are now 113 Open Banking products live in the UK with 311 organisations licensed to deliver Open Banking in the UK market.
- 320,000 open banking payments were made in 2018, a figure which has subsequently risen to more than 3.4 million in 2020. The first business loan using open banking data was issued in November 2018, and throughout 2020 TPPs routinely used open banking data to help consumers assess and boost their credit scores.

By the end of 2020, more than 2.5 million UK consumers and businesses used open banking enabled products to manage their finances, access credit and make payments.

THE OPEN BANKING IMPLEMENTATION ENTITY (OBIE)

The Open Banking Implementation Entity (OBIE) was set up by the CMA in 2016 to deliver Open Banking. Its trading name is Open Banking Limited. OBIE is governed by the CMA and funded by the CMA9 (Allied Irish Bank, Bank of Ireland, Barclays, Danske, HSBC, Lloyds Banking Group, Nationwide, RBS Group and Santander). It works with the CMA9, as well as challenger banks, financial technology companies, TPPs and consumer groups. OBIE's role is to:

- Enforce the obligations on the CMA9 under the CMA Order;
- Design specifications for Open Banking APIs that banks and building societies can use to provide Open Banking services securely;
- Support regulated TPPs and banks and building societies in using Open Banking standards;
- Create security and messaging standards;
- Manage the Open Banking Directory allowing regulated participants to enrol in Open Banking;
- Produce guidelines for participants in the Open Banking ecosystem; and
- Set out the process for managing disputes and complaints.

Future of OBIE – In June 2020, UK Finance suggested a model which would see the continuation of Open Banking functions moved into a new service company as the final stages of the CMA implementation roadmap come to an end in 2021. In March 2021, UK Finance published detailed proposals for a new service company, Open Banking, which will support the UK's open banking infrastructure.

The proposed service considers the requirements made by the CMA9 banks. It also ensures there is flexibility to accommodate changes outside of Open Banking to include other parts of finance and other industries, such as Open Finance and Smart Data.

The new service company will enable UK consumers, small businesses and corporates to benefit from a highly efficient, safe and reliable Open Data and payments market, as well as continuing to provide a platform for UK financial institutions to meet their regulatory obligations under the CMA Order and PSD2.

The service company will provide a set of service capabilities which meet the needs of the Open Banking ecosystem and help to ensure its stability and resilience. These include managing the centralised Open Banking directory, maintaining technical standards and enabling future improvements.

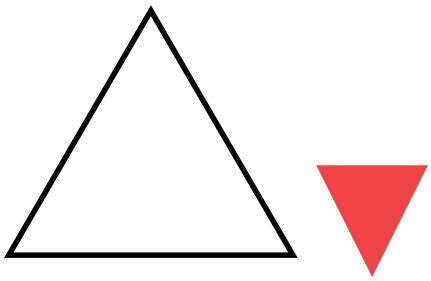
Key Finding: Following the HM Treasury regulation, CMA Open Banking commitments and PSD2 implementation, UK banks have transformed their proven payment infrastructure for Open Banking, while developing mobile immediate payment services based on the Faster Payments Scheme in a second step.

The UK market is at the forefront of Open Banking, having set its own framework and API standard. The leading UK banks added AISP services and immediate payments to mobile banking on demand as regulatory standards, including RTS SCA, RTS XS2A and the UK Open Banking API set from OBIE.

As of the end of 2020 there were 73 PISPs and 184 AISPs licensed in the UK by the FCA. After Brexit, the passporting regime has changed and there temporary permissions in place to allow non-UK regulated TPPs previously permissioned under the EU's passporting scheme to do business in the UK. In total, 200 TPPs and 67 foreign TPPs can connect to UK banks via the bank's API set..

Open Finance Outlook: According to UK Finance and the CMA9 banks, there are plans for the roll out of the country's Open Banking model beyond payments. A new non-profit UK service company is expected to pave the way for the UK Open Banking model to be extended to other products, including consumer credit, insurance, mortgages, pensions and savings. Doing so would involve an expansion of the Open Banking model in the UK with the adoption of Open Finance and smart data frameworks.

THE UK



Readiness Index Position

OPEN BANKING READINESS INDEX: CATEGORY 2

Internet Use:

96%	99%	88%	87%	80%
Households with internet access	Last internet use (12 months)	Internet users who bought online	Last online purchase (12 months)	Last online purchase (3 months)

Digital Communication Infrastructure:

Mobile phone subscription:	Smartphone penetration:	4G LTE internet penetration:	Digital banking penetration:
118.4% PER CAPITA	82.9% OF MOBILE PHONES	84.7% 5G NETWORK LAUNCHED	88% OF 14-76 AGED CAPITA

Bank-backed Open Banking Infrastructure:

- Open Banking regulation: CMA Open Banking commitments and PSD2 implemented 2018
- Open Banking licenses: 73 PISPs, 184 AISPs licensed in the UK by FCA, 67 TPPs passported
- Open Banking APIs: Open Banking API standard of Open Banking UK (OBIE)
- Payment initiation services: mobile payment schemes Paym, Pay By Bank App: online, POS, P2P
- Instant payment services: added to digital banking
- Instant payment initiation: Paym, Pay By Bank App: online, POS, P2P
- Account information services: in 2018, the CMA9 banks were first

Case Study

FASTER PAYMENTS AND MOBILE PAYMENTS IN THE UK

Faster Payments is the UK's 24/7 immediate payments service for the same-day processing of payments initiated over the internet or by mobile phone.

Four types of payments can be processed through the Faster Payments Scheme: Single Immediate Payments, Forward-dated Payments, Standing Orders and Direct Corporate Access.

Faster Payments allows for the same-day processing of payments initiated over the internet or by telephone, up to a maximum value of £100,000. From November 2015, the Faster Payments limit for banks and building societies has been raised to £250,000 per payment. The change has been made to meet growing demand from large corporate users.

In 2019, the Faster Payment Scheme (FPS) had 32 direct participants that connect straight to the service, while a further 400 Payment Service Providers can access the service indirectly through a sponsor bank.

The FPS processes virtually every mobile and online banking payment made in the UK – over 2.43 billion Faster Payments worth £1.94 billion were processed in 2019. Between 2018 and 2019, the number of FPS transactions increased by 19%.

Based on Faster Payments, there are two mobile digital payment services in the UK:

- Paym: the mobile payment launched by UK Finance and backed by the UK high-street banks.
- Pay-By-Bank App: the online checkout app that lets UK buyers pay using the mobile bank app of their bank.

Paym – The mobile payments platform Paym was launched by UK Finance in conjunction with Bank of Scotland, Barclays, the Cumberland Building Society, Danske Bank, Halifax, HSBC, Lloyds Bank, Santander and TSB Bank. Other UK banks joined in a second phase. Paym is available to 45 million account holders at one of the 15 banks supporting Paym.

Paym is run by the Mobile Payments Service Company (MPSCo). According to MPSCo, the most common reason for using Paym is paying people back money owed for buying a group present (23%), petrol (23%), helping with bills (22%), paying back IOUs (19%), household costs (18%), lunch or dinner (14%) and paying a small business (13%).

The Paym service is offered directly to customers by participating payment service providers. Users can send person-to-person and person-to-business payments by simply entering the recipient's mobile phone number – no sort code or account number is required. To send money, users log into their bank's mobile app and select a recipient using their existing contacts or by typing in a mobile phone number. They then confirm they have selected the correct recipient, check the amount to be paid, type in a reference for the transaction and press send.

To receive Paym payments, users register their mobile number with their bank and then select the current account they want any payments sent via the service to be paid into. By the end of December 2019, four million UK bank account holders have signed up for Paym, and there were Paym payments with a value of £800 million since its launch in April 2014.

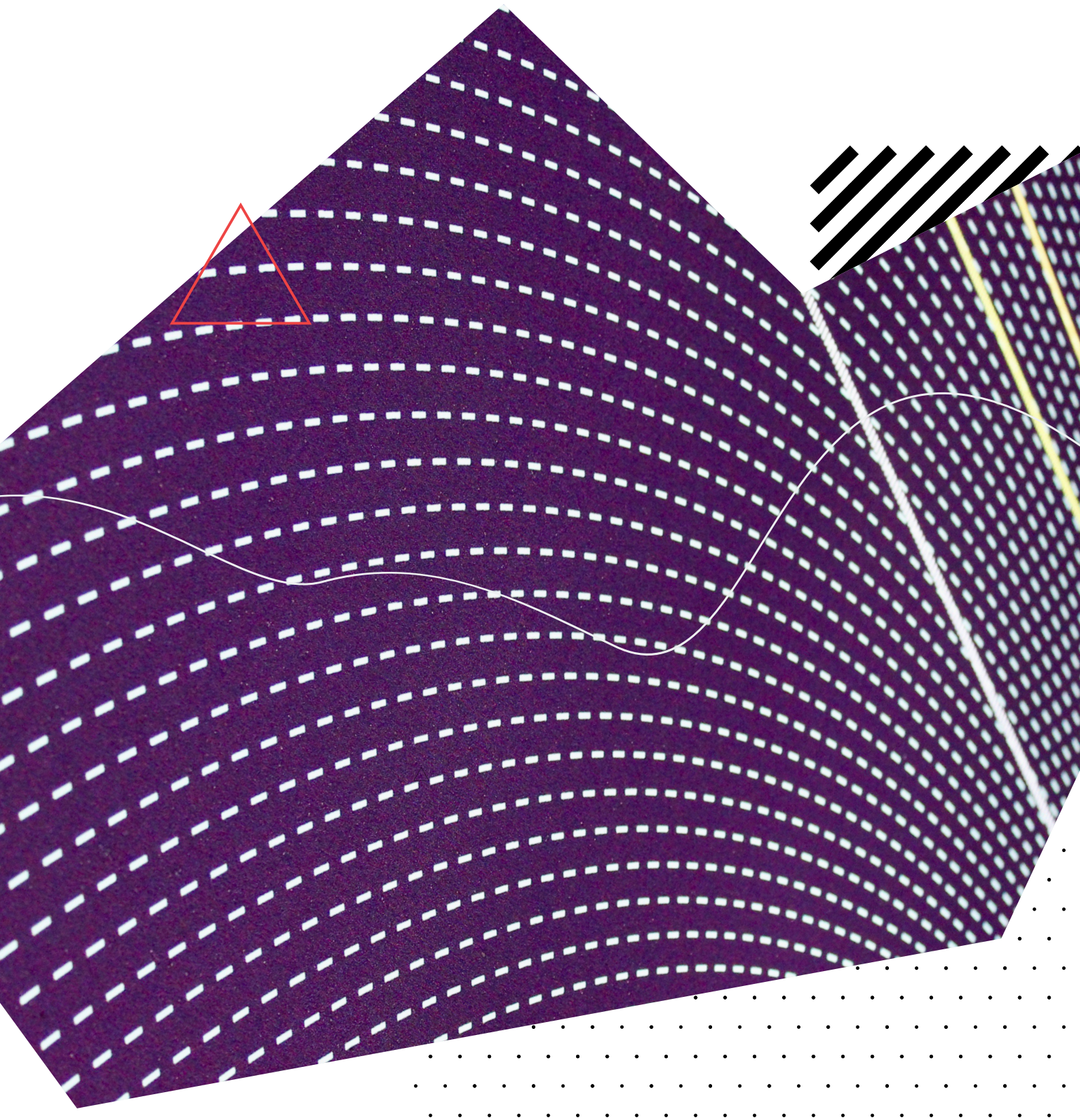
Pay-By-Bank App is an online checkout option that lets UK buyers pay using the mobile bank app on their phone.

In June 2013, VocaLink launched ZAPP, a function that resides within mobile banking apps to allow users to make real-time payments to retailers when shopping online or in-store. Since 2015, ZAPP was rebranded Pay by Bank App and has been open to all financial institutions, merchants, acquirers and consumers. UK bank clients were able to make NFC and QR-code payments in-store and for online payments.

Users can make cardless immediate payments at the checkout without a credit or debit card, by loading a mobile app and then scanning a QR-code or barcode, or tapping a reader, with their phones.

A ZAPP payment works through secure digital tokens, which means that customers don't reveal any of their financial details to retailers. This also means that merchants do not need to store card details.

In January 2018, Shieldpay teamed up with VocaLink's Pay-by-Bank app. Shieldpay's payments network aims to protect buyers and sellers in any transaction by verifying the identity of all parties – funds are only released when both parties agree. Shieldpay enables users to create an instant digital escrow facility and aims to eliminate fraud in P2P payments.



READINESS COMPARISON

Open Banking Readiness

OPEN BANKING READINESS INDEX

DIGITAL COMMERCE READINESS	DE	DK	ES	FR	HU	IT	NO	PL	SE	UK
Households with internet access (%)	95%	95%	91%	90%	86%	85%	98%	87%	96%	96%
Last internet use (individuals, 12 months)	94%	97%	91%	91%	83%	78%	99%	82%	98%	96%
Internet users who bought online (%)	84%	87%	64%	77%	59%	49%	83%	66%	84%	91%
Last online purchase (individuals,12 months)	79%	84%	58%	70%	49%	38%	82%	54%	82%	87%
Last online purchase (individuals, 12 months)	71%	74%	47%	58%	35%	28%	67%	41%	70%	80%
eGDP (% of GDP in 2019)	2.7%	6.4%	4.3%	4.3%	1.1%	1.8%	3.3%	2.2%	1.8%	7.9%
DIGITAL INFRASTRUCTURE READINESS	**DE**	**DK**	**ES**	**FR**	**HU**	**IT**	**NO**	**PL**	**SE**	**UK**
Mobile phone subscription per capita (%)	128.4%	125.5%	118.3%	110.6%	106.1%	133.1%	107.2%	137.9%	126.3%	118.4%
Smartphone penetration (%) of mobile phones	79.9%	88.0%	72.5%	77.5%	73.9%	60.8%	95.0%	75.0%	78.8%	82.9%
4G LTE internet penentration (%)	76.9%	88.6%	87.4%	79.7%	91.4%	79.0%	95.5%	82.9%	91.1%	91.1%
5G internet penentration (%)	launched	launched	76.0%	launched	launched	launched	launched	planned	launched	launched
Digital banking penetration (%)	61%	91%	55%	66%	47%	36%	95%	47%	84%	78%
OPEN BANKING INFRASTRUCTURE READINESS	**DE**	**DK**	**ES**	**FR**	**HU**	**IT**	**NO**	**PL**	**SE**	**UK**
Open Banking Payment Regulation implemented	PSD2, GDPR implemented	PSD2, GDPR implemented	PSD2, GDPR implemented	PSD2, GDPR implemented	PSD2, GDPR implemented	PSD2, GDPR implemented	PSD2, GDPR implemented	PSD2, GDPR implemented	PSD2, GDPR implemented	PSD2, GDPR implemented
Digital Payment Instruments used	SCT, SDD, SCT INST	domestic CT realtime	SCT, SDD, SCT INST	SCT, SDD, SCT INST	domstic CT AZUR	SCT, SDD, SCT INST	domestic CT realtime	Elixir Express Elixir	domestic CT realtime	BACS Faster Payments
Open Banking licenses in country for PISPs	24	4	7	11	1	5	2	6	13	66
Open Banking licenses in country for AISPs	36	8	7	18	6	8	2	10	26	161
Open Banking: ASPSPs	39	24	21	38	7	20	85	16	19	82
Open Banking: TPPs (=PISP + AISP)	36	10	8	21	5	9	4	12	28	173
Open Bank APIs	68	53	46	89	34	53	194	46	44	166
API Aggregators	20	20	20	19	17	19	19	19	19	22
Open API Standard in country	FinTS, NextPSD2	Nordic API	outsourced to one aggregator	STET	n/a	outsourced to one aggregator	Nordic API	PolishAPI	Nordic API	Open Banking UK
OPEN BANKING PAYMENT READINESS	**DE**	**DK**	**ES**	**FR**	**HU**	**IT**	**NO**	**PL**	**SE**	**UK**
Digital credit transfer payment service on domestic level	giropay	MobilePay	MyBank, Bizum	per bank app Lyf Pay	per bank app	MyBank, Bancomat Pay	Vipps	BLIK	Swish	Faster Payments
Open Banking Payment apps on domestic level	paydirekt	Mobile Pay	Bizum	per bank app Lyf Pay	per bank app	Bancomat Pay Jiffy	Vipps	BLIK	Swish	Paym, Pay by Bank App
OBP Payment Use Cases	online payment P2P payments	POS payments online payments P2P payments	POS payments online payments P2P payments	POS payments online payments P2P payments	POS payments online payments P2P payments	POS payments online payments P2P payments	POS payments online payments P2P payments	POS payments online payments P2P payments	POS payments online payments P2P payments	POS payments online payments P2P payments
AISP service as part of digital banking (note: most local banks added AISP to mobile banking)	all bank apps FinTechs	Danske Bank FinTechs	all bank apps FinTechs	all bank apps FinTechs	all bank apps FinTechs	all bank apps FinTechs	DNB Bank FinTechs	ING bank apps FinTechs	bank apps, Tink FinTechs	all bank apps FinTechs

Note: the numerous individual savings banks, cooperative banks and mutual banks per country are counted as one ASPSP. Reason: they have de-facto one banking processors on group level.

Source: PCM research. Data collected Dec 2020 - May 2021

Abbreviations

The report comprises a set of abbreviations used in the country profiles where appropriate. Common in the digital payments industry and in Open Banking, the report provides this list of abbreviations as a kind of glossary:

A2A	Account-to Account; synonym for cardless payments directly between bank accounts, e.g. credit transfers, immediate payments, direct debits
AIS	Account Information Service, according to the PSD2
AISP	Account Information Service Provider, according to the PSD2
API, Open Banking API	A language and message format used by software applications to communicate with each other; also: Open API, Public API, Partner API, Private API
ASPSP	Account servicing payment service provider, according to the PSD2
BIC	Business Identifier Code (8 to 11 digits)
CMA	Competition and market Authority
CSM	Clearing Settlement Mechanism
EBA	European Banking Authority, www.eba.europe.eu
EC	European Commission, www.ec.europe.eu
ECB	European Central Bank, www.ecb.int
EPC	European Payments Council, www.europeanpaymentscouncil.eu
EEA	European Economic Area (27 EU + UK + 4 EWR countries)
EU	European Union, www.europe.eu
Exemption	Banks providing an API can apply to be exempted from providing the so-called fallback to the API i.e., the MCI. If approved by the local Financial Supervisory Authority (FSA) the bank does not have to provide an MCI.
FSA	Financial Supervisory Authority – a national financial market regulator
HCE	Host Card Emulation: technology to store card credentials in the cloud instead of storing them on the mobile phone
HCE NFC	card credentials stored in the cloud and not in an NFC capable mobile phone
IBAN	International Bank Account Number
MCI	Modified Customer Interface – Method for a TPP, PISP or AISP to access bank accounts through online bank/customer portal as an alternative to using an API
NCB	National Central Bank of a country
NFC	Near Field Communication, i.e. contactless technology
OBP	Open Banking Payments, e.g. OBP processor
P2P	Person-to-Person: e.g. mobile P2P money transfers
PIS	Payment Information Service, according to the PSD2
PISP	Payment Information Service Provider, according to the PSD2
POI	Point of Interaction, acronym for multi-channel POS types
POS	Point of Sale
PSD2	Revised Payment Services Directive
PSP	Payment Service Provider
RBA	Risk-based Authentication
RTS	Regulatory Technical Standards, issued by the European Banking Authority
SCA	Strong Customer Authentication, according to the European Banking Authority
SCT	SEPA Credit Transfer, i.e. euro bank transfer standard
SCT Inst	SEPA Instant payment instrument, a SCT variant
SDD	SEPA Direct Debit payment instrument
SEPA	Single Euro Payments Area, comprising the 19 euro countries (2021)
SME	Small & Medium Enterprises
TAN	Transaction Authentication Number, used to secure online banking transactions, also iTAN, mTAN
TPP	Third Party Provider – an authorised payment service provider that connects to banks via an API or MCI, offering Account Information Services and/or Payment Initiation Services.
TX, TXs	abbreviation for transaction or transactions
VAT	Value Added Tax
XS2A	Access to Account for authorised TPPs with explicit customer consent

About the Research

PAYMENTS CARDS & MOBILE

In business since 1994, Payments Cards & Mobile is an established hub for global payments news, research and consulting. We work with recognized industry experts to provide impartial, up-to-date and relevant information and analysis on every area of payments.

Personal relationships have been the hallmark of our business. We remain committed to working closely with our many long-standing customers and welcome new customers in producing quality business intelligence and providing a variety of ways in which you can consume this information. Our aim is to provide you with the highest quality data so you can position your business and key personalities in this increasingly competitive industry.

PCM RESEARCH

Payments Cards & Mobile Research offers comprehensive, in-depth research into topics which are relevant and tailored to our clients' needs. Our in-house research facility is available for short term projects. We specialize in M&A activity, market entry data, country report analysis and statistics. Research reports on banking, payments and mobile payments worldwide.

Topics range across the measurement of efficiency and performance, card and digital payment service-related information, the role of brands in banking and the impact of non-banks such as retailers and FinTechs on the financial services and mobile financial services market.

Payments Cards & Mobile offers specific research on all aspects of digital banking, card payments, cardless digital payments, Issuing/Acquiring, financial services and the mobile financial services market.

ABOUT MASTERCARD (NYSE:MA)

Mastercard is a global technology company in the payments industry. Our mission is to connect and power an inclusive, digital economy that benefits everyone, everywhere by making transactions safe, simple, smart and accessible. Using secure data and networks, partnerships and passion, our innovations and solutions help individuals, financial institutions, governments and businesses realize their greatest potential. Our decency quotient, or DQ, drives our culture and everything we do inside and outside of our company. With connections across more than 210 countries and territories, we are building a sustainable world that unlocks priceless possibilities for all.

METHODOLOGY OF THE REPORT

This report is composed of results from recurring market research into Europe's payments industry and its financial services industry. In addition, the views of leading banks, payment service providers, payments industry experts and regulators have been examined. In March 2021, the following key questions were researched, with answers used in this report, comparing ten European countries:

- how that country's Open Banking strategy fits the digital economy
- how the country has implemented PSD2 into domestic banking law
- whether an instant payment scheme or a domestic immediate payment scheme has been implemented
- digital infrastructure readiness and the maturity of digital banking use
- the addition of account aggregation and payment initiation to digital banking services
- digital account-to-account payment service schemes on domestic country level
- active Open Banking licenses in country, including TPPs with EU passports
- active Open Banking API sets at APSPs in country, domestic Open Banking API standards (implemented or planned)

The Open Banking Readiness Index 2021 is based on research results and market data collected Dec 2020 - May 2021.

SOURCES

The report draws on statistics, annual reports, and information from the European Central Bank (ECB), the Bank of International Settlement (BIS), the European Banking Authority, national central banks (NCBs), domestic payment organisations and banking associations, individual payment service providers, and commercial, cooperative and savings banks.

E-commerce and m-commerce figures reported draw on statistics and information from Eurostat, GSMA association, the International Telecommunication Union (ITU), online payment service providers, and payment processors.

ACKNOWLEDGEMENTS

The author thanks all those individuals and organisations who have kindly supplied information and statistics, especially for the helpful responses to selected questions on Open Banking payment services, Open Banking payment platforms and the emerging Open Banking ecosystem.

AUTHORS

Since 2011, Horst Forster has been co-editor of the European Payment Cards Yearbook, responsible for market analysis and for compiling/writing the country profiles. Horst has more than twenty years' expertise in both omnichannel card business and cardless Open Banking payments. Cross business and cross borders – his profession is business development and market intelligence services for the payments Industry, including digital payments in the emerging Open Banking ecosystem.

James Wood is Managing Editor at Payments Cards & Mobile (PCM). James has more than 20 years' experience in journalism and communications, and has freelanced for The Financial Times, The Daily Telegraph, The National Post (Canada), and a wide range of trade publications. As Managing Editor, James is responsible for six issues of PCM annually, as well as client research reports and the development of PCM's editorial profile. James holds a BA and MA from Cambridge and an MBA with Distinction.

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