TEMENOS

THE BANKING SOFTWARE COMPANY

How Temenos enables

Open Banking and the Revised Payments Directive (PSD2)

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Executive Summary

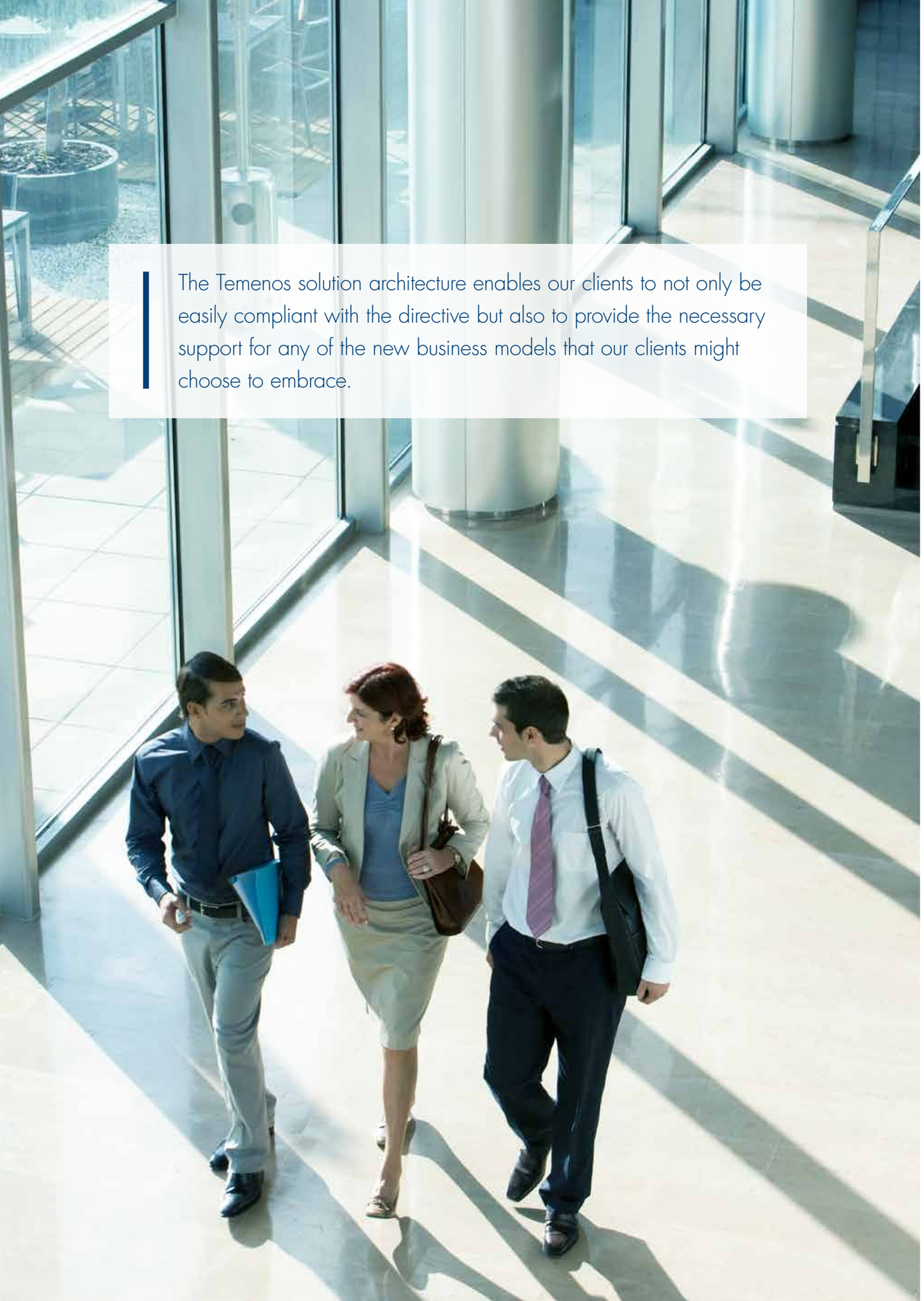
Open banking is the adoption of common standards for collaboration between banks and other players within the banking eco-system. This paper argues that the widespread uptake of open banking globally, accelerated by the Revised Payments Services Directive (PSD2) in Europe, will lead to new opportunities and challenges for banks. Expected to come into force by late 2018, PSD2 is intended to increase competition and innovation within the European banking industry in order to improve the banking experience for the end-customer. For this reason, it has implications well beyond Europe. Accenture has described PSD2 as an "open banking laboratory" that will be closely watched by the rest of the banking world.

PSD2 prescribes the opening of account information to third parties, such as aggregators of customer financial information across multiple institutions, or payment providers. In order to protect themselves from the consequent risk of losing their direct relationship with customers (disintermediation), banks are likely to respond to the directive by not merely complying, but by exploiting the directive to create new business models aimed at creating new and deeper relationships with customers and at generating new revenue streams. Some banks may become account aggregators and/or cross-institutional payment providers themselves. Others may choose to become back-office manufacturers of banking products leaving the customer relationship to others.

Beyond PSD2, open banking could lead to the rise of platform models for banking services where banks act as market intermediaries connecting customers, manufacturers and distributors.

In all cases, open banking and PSD2 will place new demands on the underlying technology architectures of incumbent banks such as the need for real-time 24x7 support for open Application Programming Interfaces (APIs) and messages, performance and scalability to deal with the higher and less predictable query and transaction volumes expected, and enhanced security and authentication. Many European banks are not equipped for this change because of the limitations of their aging legacy systems. Interestingly, modern API-based architectures are beginning to appear in the industry to address these challenges, brought to market by both, agile new entrants and banks that have recently overhauled their IT landscapes.

Where Europe and PSD2 lead, we expect much of the rest of the world to follow, and have therefore designed our solution from a global perspective.



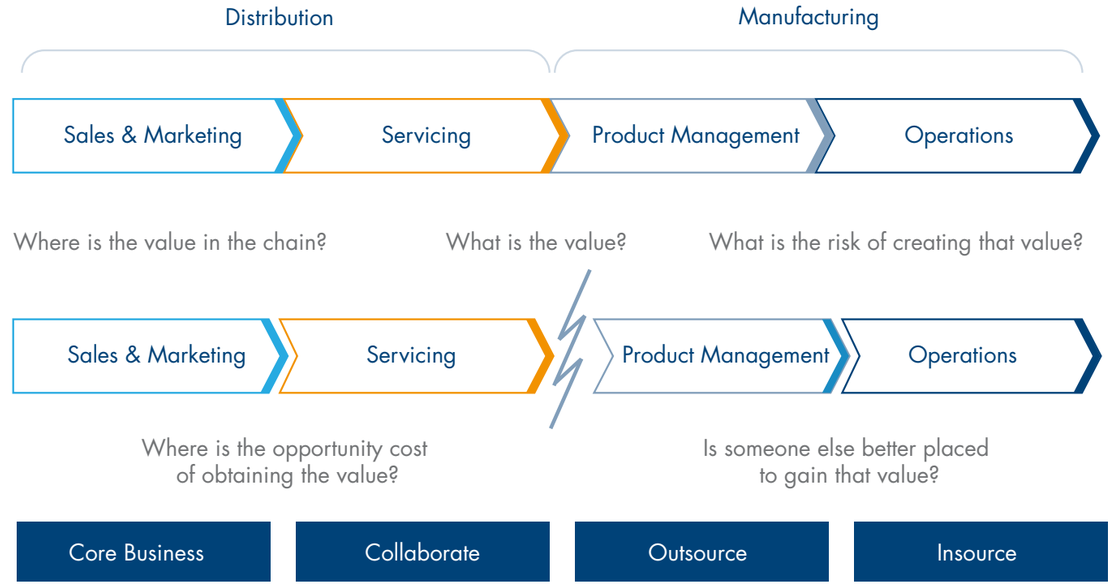
> The Temenos solution architecture enables our clients to not only be easily compliant with the directive but also to provide the necessary support for any of the new business models that our clients might choose to embrace.

Structural Change – Disintermediation of the Banking Value Chain

Since the 2008 financial crisis, banks have been facing significant change. The widespread consumption of digital banking services particularly by technologically savvy, less loyal customers, the success of low-cost disintermediation services such as comparison websites, and the rise of agile, consumer-oriented non-traditional players, whether fintechs, retailers or technology providers, combined with the high costs of operation of incumbent banks, is leading to the removal of end-to-end manufacture and distribution of products and services entirely, within a bank.

> **Large banks will fragment as they seek to protect the profitable parts of their operations.**
>
> Antony Jenkins, the former CEO of Barclays

Figure 1: Disintermediation of the banking value chain



As a result, traditional full-service banks with vertically integrated operating models used to doing everything themselves, are being forced to re-evaluate the way they do business. Banks are assessing which elements of their value chain truly add value to the end customer and which do not, how much value is created, what are the associated risks and costs and what are the opportunity costs of divestment. Accordingly, banks may decide to focus on certain processes themselves, may consider outsourcing and other innovative partnership models for sections of their value chain or may in-source certain business from other banks, leading to the rise of new banking models – utilities servicing other customer-facing institutions (manufacturers), digital marketplaces offering products to customers from multiple providers (distributors) or intermediaries connecting distributors to manufacturers (B2B platforms).

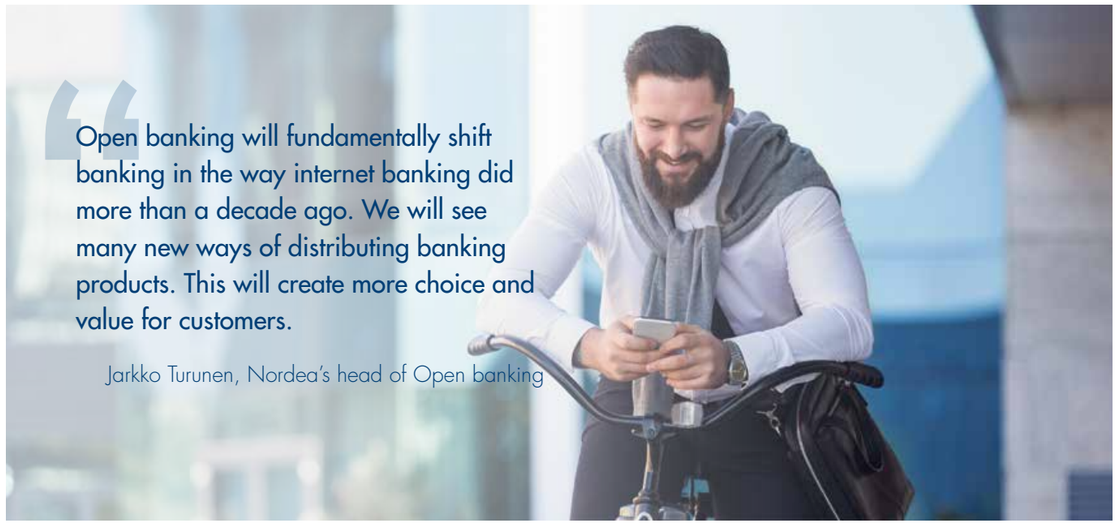
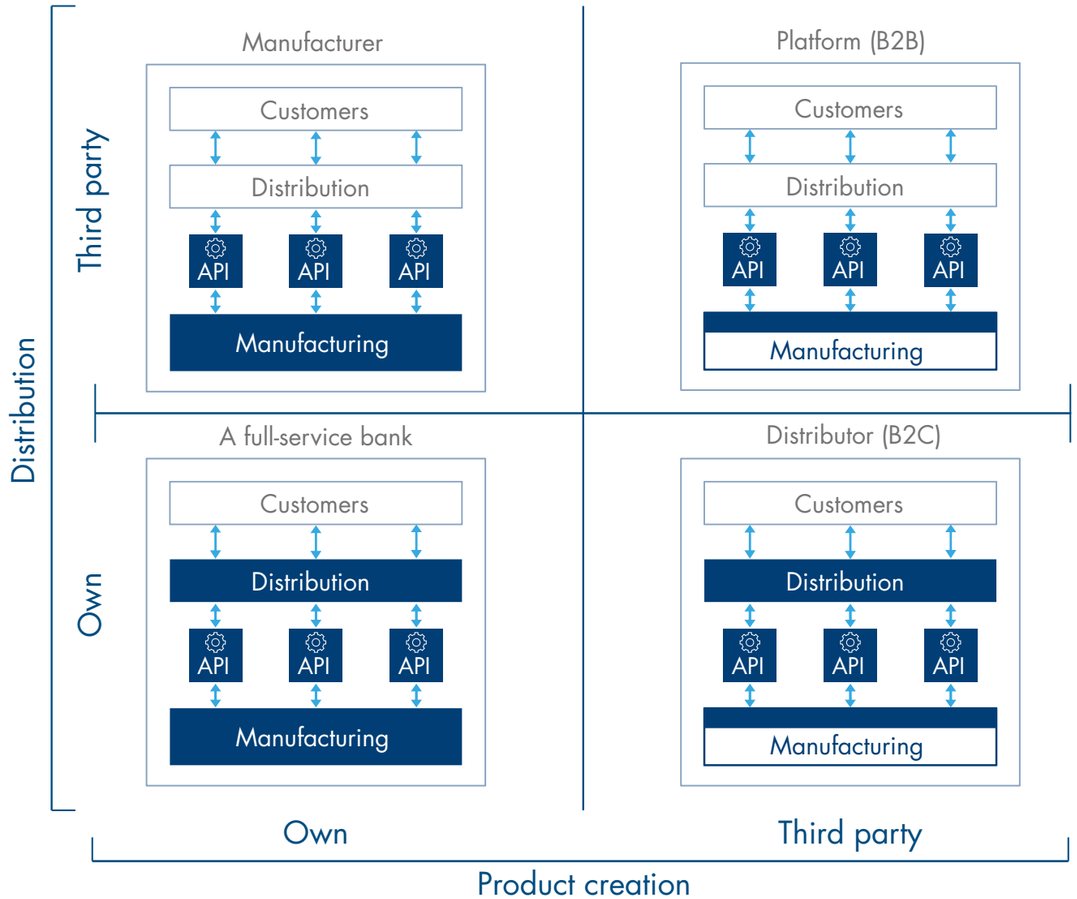


Figure 2: Rise of new banking business models



Open Banking – Common Standards for Collaboration

The move from competition to collaboration with other players in a wider eco-system paves the way for the adoption of common standards as a means of interacting with third parties such as developers, customers and partners like fintechs, telecoms, retailers or other banks. Open banking is the resulting global phenomenon of the disintermediation of the banking value chain. It makes data, algorithms, transactions, business processes and functionality available to other players in the banking eco-system. Providing the end-customer greater control over which financial products and services they consume and from whom, is a fundamental tenet of open banking.

Open banking is as much about the establishment of an improved IT architecture as it is about structural change across the banking industry. An API-based end-to-end integrated architecture that enables ease of consumption of third party banking products and services as well as ease of provision of own banking services to third parties will be a key requirement to support the open banking business models of the future. Gartner defines open banking architecture as the provision of banking services in the context of users through API platforms comprising app stores and apps.

There is broad consensus in the industry that APIs are the de-facto standard to facilitate communication between the various parties in an open banking eco-system as they are scalable, reusable and easy-to-use. APIs provide real-time access to open data and secure access to private data for third parties, as well as enable third-party developers to build applications and services around the bank.

There is an increasing expectation in the industry that in future, banks will not only compete on the financial services they provide but also on the apps and app stores they bring to market. Banks are expected to become platforms for third-party innovation by developers, innovators, customers and competitors alike by opening their architecture through the use of APIs.

The technology giants, Amazon, eBay and Facebook have a long history of providing and often monetizing standardized API platforms on which third-parties can build applications under a well-defined set of rules. At Amazon, Jeff Bezos issued his API mandate to all developer staff as early as 2002 – he decreed that all service interfaces, without exception, must be designed from the ground up to be able to be exposed externally. From a business perspective, this has given Amazon the agility to enter new business domains at will. Amazon Marketplace Web Service (Amazon MWS) is an example of an Open API that helps Amazon sellers to programmatically exchange data on listings, orders and payments with Amazon, so that their end-customers get a seamless and more responsive buying experience.

In the same fashion, banks could use external APIs to create value-added services for customers such as the ability to make straight-through car insurance payments directly from the bank's portal, providing ex-ante recommendations of the best products to buy, providing better and cheaper access to credit because of the banks' access to third party transactional data, or offering multi-bank personal finance management and consolidated treasury dashboards to retail and corporate customers respectively.

APIs can be monetized through various mechanisms – pay per use, subscription fees fixed for a specific period at an agreed price, tiered pay-as-you-go or revenue-sharing leading to the rise of the API economy. According to McKinsey[1], "banks are used to defending their slice of a $4 billion industry. But they are actually part of a larger networked digital economy centered on the distribution of every single customer good and service that will reach $60 trillion by 2025. Even a small share of this can be worth much more than their defensible share of the banking sector."

APIs are not new in banking. APIs as a technical concept have existed for a long time both within and outside the banking industry. APIs are nothing but the interfaces that an application supports and they clearly define how the application can communicate with other applications. 'Internal' APIs are commonly used within a bank to allow communication between different applications. For example, APIs exposed by a core banking application could be consumed by the bank's channel solutions. 'External' APIs are available for third par ty consumers. 'Open APIs' extend from the 'external' APIs concept and provide a mechanism for applications or systems to collaborate with each other and operate together.

In the past few years, banks have started exposing APIs for external consumption. Payment processors such as Paypal, Mastercard and Visa have been running third-party developer programs since 2009. Credit Agricole was one of the first full-service banks to launch the CA App store in 2012, an online marketplace that crowd-sources new ideas for banking applications from customers and allows third-party developers to create new banking applications in response, through the use of Open APIs. Today, more than 40 third-party apps are available in the store. Examples include gamification of savings goals, location of transactions on a map and healthcare expense management. ABN Amro is another example of a bank that has set up Tikki, the first payment app that allows customers to send payment requests via Whatsapp using open APIs. More recently, neo-banks all over Europe such as Fidor, Atom, Monzo and Starling have launched Open API platforms inviting third-parties to build value-added services for their customers.

1. McKinsey Global Banking Annual Review 2016

UK AND GERMANY LEAD THE WAY IN OPEN BANKING IN EUROPE.

In the UK, the Open Banking Working Group, a consortium of 9 high street banks, was set up in 2015 by HM Treasury to develop the Open Banking Standard, a framework to guide how Open Banking data should be created, securely shared and used by its owners and those who access it using open APIs. The intention was to develop common technology, security and data protection standards across the industry for open data such as current account terms and conditions or credit data, so as to maximize its potential value through reuse. Ultimately, the working group aims to explore how data can be used to improve the banking experience for end-customers i.e. how they transact, save, borrow, lend and invest their money.

In addition, the UK's Competition and Markets Authority (CMA) published a report in late 2016 requiring banks to implement open banking by 2018 in order to accelerate technological change in UK banking and to help new entrants compete more fairly with the larger incumbent banks. The aim is to improve the banking experience for consumers of banking services by enabling them to manage and take control of their accounts with multiple providers through a single 'app' that gives them value-added services such as alerts and recommendations.

In Germany, the Open Bank Project set up by Simon Redfern of Tesobe, aims to create a standard Open source API and app store for banks to securely and rapidly enhance their digital offerings using an eco-system of third-party applications and services. They have contributed heavily to the Open Banking Working Group in the UK and have partnerships in Africa, Asia and the US. Today, the Open Bank Project has 15 banking customers including BNP Paribas, RBS and Societe Generale, 4000 developers and 100 APIs in its catalogue including access to account, payments, entitlements, KYC and payments. Pre-integrated into the Temenos core banking system, Tesobe offers European banks a PSD2 sandbox.

Challenges and benefits of open banking

Open banking will require banks to incur additional costs of vetting third parties and of supporting and maintaining the open APIs they publish. It also poses a significant compliance challenge to incumbent banks as exposing bank data has an associated data access and reputational risk; banks cannot afford to compromise their traditional role as custodians of customers' financial data.

Whilst open banking poses significant challenges for banks, it is widely expected to benefit the industry as a whole through accelerated innovation and competition as well as reduced costs and risks.

Open banking affords banks the opportunity to benefit from third-party innovation by accessing the latest technology, skills, methodologies and mindsets of agile third parties like fintechs and technology companies. Banks can overcome the constraints of their formal, often inflexible governance structures and processes and use their partners to fast-track the development of their apps and app stores, develop new value-added products and services and improve the customer experience on new channels and devices like wearables. Gartner predicts that this will open up new revenue streams for banks, contributing up to a 30% increase in annual banking revenues[2].

Open banking is also expected to reduce the costs, speed and ease of collaboration with third parties by replacing non-standard ways used to extract data today such as screen-scraping, manual downloads or manual entry, or even expensive bespoke bilateral connections, with open APIs.

On-boarding will be cheaper and frictionless through digital sign-ups and the costs of switching will reduce as automated porting of complete account history replaces manual uploads of select information. In addition, improved identity verification and authentication standards will enable better monitoring and detecting services, reducing fraud across the industry.

While we cannot predict what will happen, we can be sure that open banking will only take off if it creates tangible value for the end-customer: greater relevance and personalization, more transparency on pricing terms and conditions, greater choice and more convenience. If customers are to create their own curated virtual everyday banking universe that is a portfolio of cherry-picked offerings from multiple providers of financial services, those banks that proactively position themselves at the center of this universe rather than those that find themselves at the periphery, will be the winners.

2. Gartner Hype Cycle on Open Banking 2016
3. Gartner Hype Cycle on Open Banking 2016

Gartner estimates a 90% reduction in time and cost to market[3].

The Revised Payments Services Directive (PSD2) – a Catalyst for Open Banking

PSD2 is the catalyst causing a step change in the industry's perception, understanding and willingness to embrace open banking. While it is a European directive, it has implications beyond Europe because of its stated intent to increase competition and innovation in the industry for the ultimate benefit of the end-customer.

The rest of the world is keeping a watchful eye on developments in Europe and likely to follow suit once European banks start to demonstrate success from their open banking initiatives. For example, leading Australian banks are already taking steps to emulate the approach of European banks to open APIs, despite not being impacted directly by PSD2. As one said:

> In our view, open banking and open APIs are important for us because they will help to fuel the integration of our multinational customers operating or based in Europe.

Even in the US where regulation is not imminent, banks like JP Morgan, Wells Fargo and Citi have recently launched Open API platforms while technology giants like Apple. Amazon, Google and Paypal have been lobbying policymakers for greater empowerment to customers and small businesses to securely access their own accounts via whatever application or technology they choose.

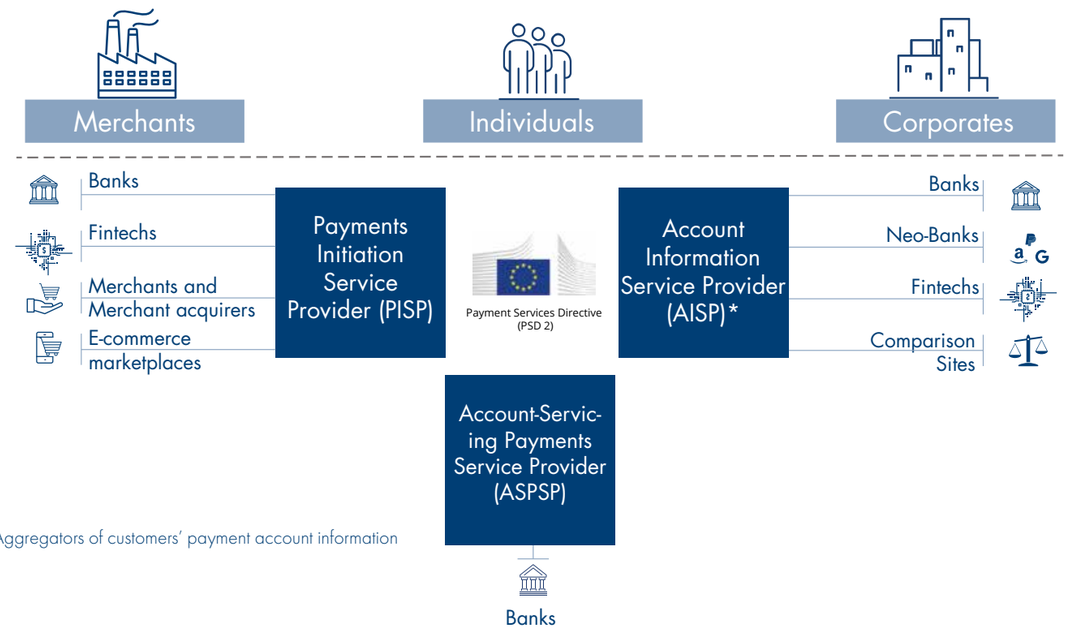
While banks will be obligated to provide account and payments information that has always been considered proprietary by them, and to facilitate payments from third parties, third-parties too will face more regulation on data protection that will boost user confidence in the legitimacy and reliability of their services. The ultimate aim of PSD2 is to drive competition and foster innovation by creating a level playing field for banks and new entrants alike, enabling easy-to-use and secure digital payment services that benefit consumers.

Figure 3: Key provisions of the Revised Payments Directive

1 | Access to Account Data (Xs2A)

Account servicing payment service providers (AS PSPs) such as banks and financial institutions must provide account information to third party providers (TPPs) such as payment initiation service providers (PISPs) or account Information service providers (AISPs) in a regulated and secure way. This information which includes transaction data, balance data, credit transfer initiation, identity verification and sufficient funds check, can only be used with the consent of the customer and only by the third party that has been given consent, and only for the specific purpose consented. Though not part of the guidelines, industry consensus is that the information will likely need to be provided through APIs.

Figure 4: Who is who in the PSD2 world?



*Aggregators of customers' payment account information

2 | Strong (2-factor) authentication

for customers on all channels must be provided by the AS PSPs, increasing their liability. OAuth 2.0*[4] is a standard likely to be used by both banks and third-parties.

3 | Transparency

whereby all payment service providers (AS PSPs as well as PISPs) must provide detailed information to the payer a priori or **before** the transaction, on the terms and conditions of the proposed transaction so the customer is made aware of the full cost of making the payment. This information includes the actual or reference exchange rate applicable for a cross-currency payment, charges with breakdowns and the expected execution time for the payment.

4 | One leg in and out transactions

where one party is outside the EU/EEA and those in any currency within the EU/EEA where there is no FX involved must be supported.

5 | Higher consumer protection

limiting payer's liability when an unauthorized transaction occurs, or when transactions have been made incorrectly, must be provided. PSD2 also contains guidelines on complaints handling.

4. Open standard that provides a simple and secure mechanism for users to authenticate themselves and to authorize how their data can be shared. It allows users to share personal and financial data between organizations without sharing login credentials. The UK's Competition and Marketing Authority (CMA) supports OAuth 2.0 as the authorization framework for ensuring security of data exchanged and for non-repudiation requirements.

Timelines and execution

13 January 2018 is the deadline for member states to transport PSD2 into national law and is considered the go-live date for PSD2 transparency and one leg transactions. The European Banking Authority published the final draft of authentication and open banking standards for PSD2 on 23rd February 2017. These are expected to come into force 18 months from this date i.e. November 2018, by which time Xs2A, 2-factor authentication and consumer protection would need to be fully implemented. For payment flows, banks in Europe can leverage SEPA instant payments infrastructure due to be completed by late 2017 to help comply with PSD2.

Although the PSD2 Regulatory Technical Standards (RTS) do not specifically mention APIs, most banking technology professionals assume that APIs will be the technological means used to allow banks to comply with the regulation. In the UK, for instance, the Competition and Markets Authority 2016 report explicitly recommends the use of REST APIs for open banking. PSD2 RTS do however mention ISO20022 message formats as a financial messaging standard for communication (dedicated interfaces) between banks.

> The real challenge is to create standards for banking APIs in terms of definition, nomenclature, access protocols and authentication.
>
> José Manuel de la Chica, Product Manager & Platform Evangelist at BBVA

Implications of Open Banking and PSD2 on Banks

It is widely believed that banks face the risk of being disintermediated by third parties under PSD2. 92% of respondents in a recent Marketforce survey expected financial services portals (AISPs) to emerge by 2026, and only 29% of these would be owned by banks. Accenture predicts a 43% reduction in payments going through banks; 1 in 10 credit card and 1 in 3 debit card transactions will move to a PISP by 2020[5].

However, compared to their non-traditional competitors, banks still possess the critical 3C's – customers, compliance and capital, and still hold customers' trust. According to Accenture's PSD2 UKI Banking Customer Survey, 76% of respondents preferred banks to be their PISP provider and 65% to be their AISP provider. 70% would not trust a third party as much as a bank with their data.

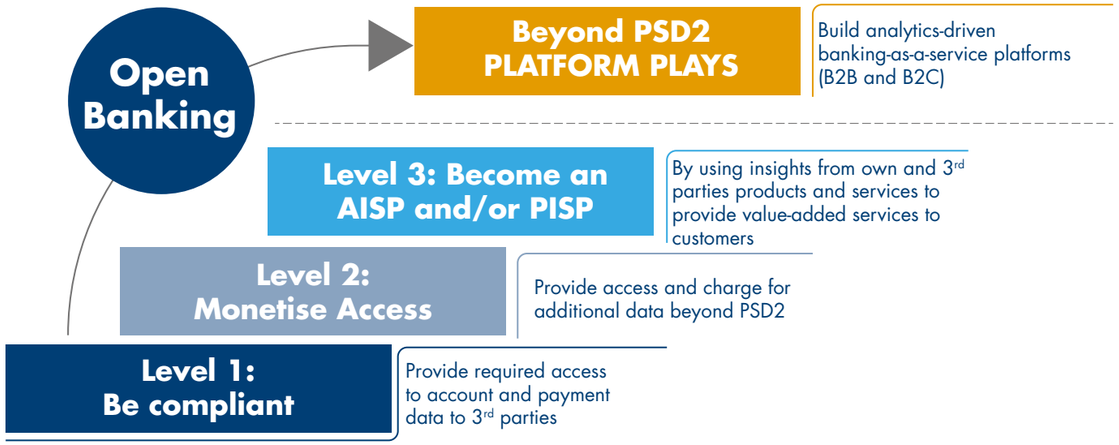
Moreover, when third parties such as fintechs or technology players start connecting directly with payment networks, infrastructure and systems, they enter a highly structured and procedural world, and risk losing their agility advantage. Therefore, PSD2 provides banks with a unique opportunity, should they choose to exploit it.

Many Tier 1 and Tier 2 banks have stated that they are keen to become AISPs and PISPs themselves. In the FIS/Finextra survey 2015, 65% respondents said they want to create their own app store with PSD2's access requirements as the launching pad.

77%

agreed that PSD2 offers banks the opportunity to become a third-party provider.

Figure 5: How banks respond to PSD2



N.B.A. Bank can select any of the levels based on their strategy; none is a pre-requisite for the other.

5 Accenture Payments: Consumers' initial reactions to the new services enabled by PSD2 2016.

We at Temenos believe banks can respond to PSD2 in three ways:

Level 1 - Be Compliant
Banks provide access to account and payment data as required by law to third parties via both APIs and ISO messages, fulfil transparency requirements by providing required payment information to the payer both before and after the transaction, support one leg transactions where one PSP is outside of the EU/EEA, and support the security and authentication standards provided by the European Banking Association (EBA). Banks that decide to merely comply, are in danger of becoming a utility while the customer experience could be owned by the third parties.

Level 2 - Monetise Access
Banks provide access to additional data and insight beyond what is stipulated by PSD2 and charge for it, creating new revenue streams e.g., non-payment account data for loans, mortgages or savings, standing orders, direct debit mandates. The data could also be provided more frequently at an additional charge e.g., balance updates for cash management provided hourly or each time the balance changes. Banks are still in danger of being disintermediated by third-parties.

Banks following a Level 2 PSD2 strategy can optionally create API marketplaces where API providers can publish open APIs that can be accessed and consumed by third parties, whether developers, peer-to-peer lenders, aggregator sites, accounting software providers, telecoms, utilities or even governments.

Level 3-Become an AISP or PSP
Banks become either an account information provider or a payments initiation service provider using insights from own and third party sources to provide additional value-added services to customers. In addition to providing financial services, banks take on the new roles of becoming access facilitators or distributors of third party products and services to their own customers, value aggregators of own and third-party products and services, and advice providers based on a 360 lifetime view of the customer. The availability and transparency of information from third parties in addition to the vast customer data they themselves hold, will enable banks to use the power of predictive analytics to truly differentiate their offers versus non-traditional competition.

Nordea
Launching an Open API Interface

In order to capitalise on PSD2, Nordea has established a site for developers who wish to experiment with the bank's open banking concept in a quest to become the "go-to hub" for banking APIs in the Nordics.

States the bank: "We see this as an opportunity to embrace the changing Financial Services landscape. Our goal is to strengthen our collaboration with fintechs and go beyond the PSD2 regulation by providing premium APIs which fit our customers' needs. The first two APIs out of the hatch will include a payment initiation API for integration with third party provider applications (PIS), and a payment account information API (AIS)."

In February, Nordea set up a site where third party developers could register and request access to a soon-to-be-released sandbox environment for testing prior to live production. Within 3 days of going live, the site had registered more than 300 signup-requests from interested software companies and developers around the world.

ABN·AMRO
Being proactive about PSD2 and open banking

ABN Amro is seeking to be a first mover in the post-PSD2 world of open banking. To this end, the bank is building a modern open API-based architecture. In anticipation of PSD2's account information service requirement, ABN Amro has already launched Gradefix, a new risk-as-a-service that uses transaction data to perform analyses and risk assessments for clients. The analyses offer consumers and SMEs a comprehensive and personalized overview of their financial situation. In future, ABN Amro is preparing to be both an AISP and a PISP, so they continue to own the primary customer relationship with new value-added services.

Technology Implications

Opening up access to customer data and facilitating third-party payment initiation poses significant technology challenges. The biggest concern is security, which the PSD2 Regulatory Technical Standards (RTS) aim to address via the requirement for strong (2-factor) customer authentication and secure exchange of customer and financial data between organizations over the internet. While the RTS are being finalized, banks have to collaborate on a secure framework to facilitate the open access by January 2018. When banks open up for data access to third parties, the volume of queries on the customer and transactions data they own, is expected to increase several fold.

For incumbent European banks, many of whom have legacy-based IT architectures, providing the enhanced security and authentication as well as the ability to scale to the expected rise in query volumes and to respond to third-party requests in acceptable timeframes in order to ensure a good experience for the end-customer, will be a costly and complex exercise. Batch processing in many systems will impede the real-time requirements of PSD2 and open banking. Moreover the complexity of multiple interfaces and systems makes it difficult to extract the data required for the open APIs and messages that the industry has agreed will be the best way forward to implement open access.

PSD2 also cements the need for banks to make systems available 24x7 and provide real-time access. Without this capability, banks will struggle to provide accurate balances and support real-time 24x7 payment execution for the end-customers of third-parties.

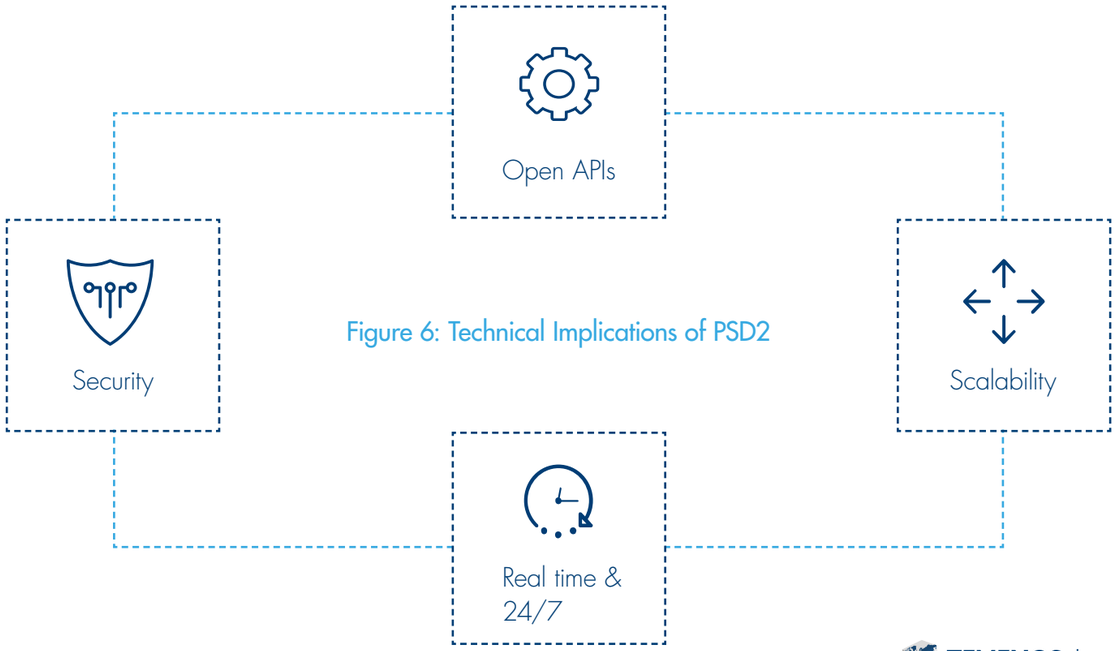
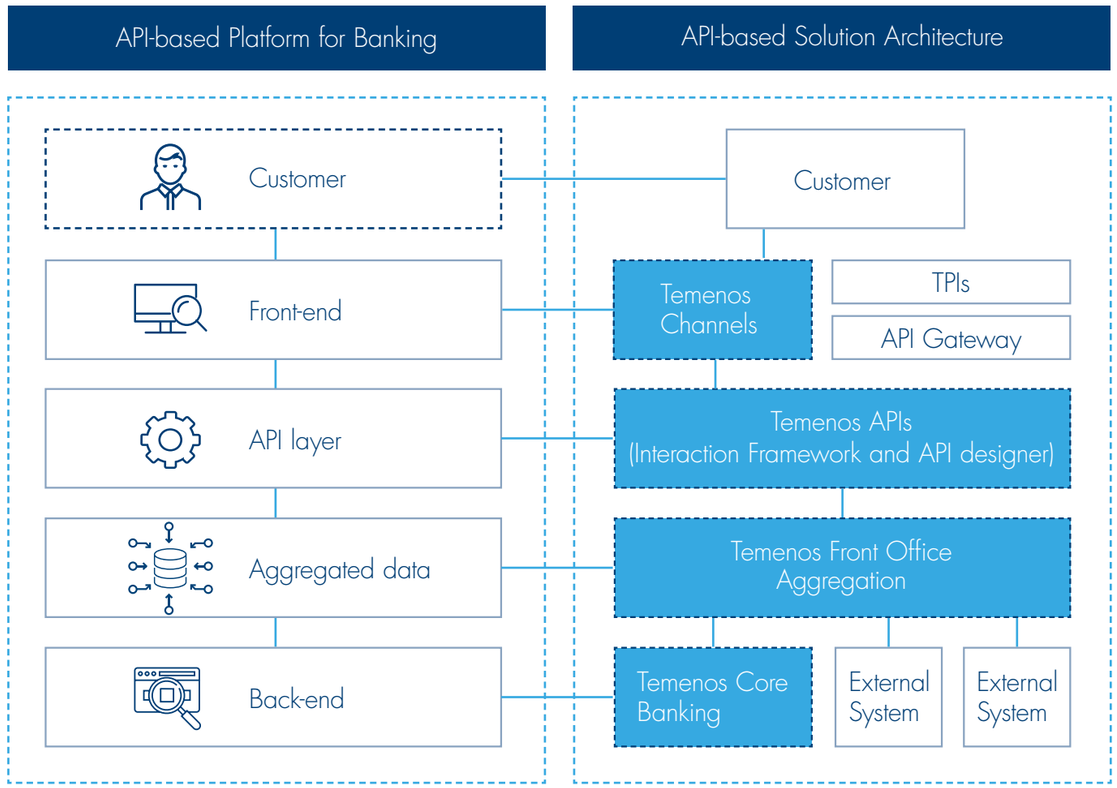


Figure 6: Technical Implications of PSD2

Temenos Response to Open Banking and PSD2

Temenos provides a fully integrated front-to-back API-based solution architecture that will enable all three levels of response. The Temenos Solution Architecture will help banks to not only comply but to implement a strong API-based framework that will capitalize on the investment required for the regulation per se. This architecture fully corresponds to the commonly accepted industry definition of an API-based technology platform for open banking.

Figure 7: Temenos API-based Solution Architecture:



Temenos Core Banking provides complete end-to-end processing capabilities across retail, private and corporate banking using common core components. The Temenos Front Office product family supports aggregation of customer information. The Temenos PSD2 APIs enable aggregation of account balances and account movements on to the Front office components, allowing customers to view their accounts, balances and transaction summary via the Temenos Channels. This aggregated data is used throughout the Temenos stack (which also includes Temenos Analytics and Temenos Risk and Compliance solutions) to generate insights using embedded analytics. For instance, it is accessed by various front office applications to provide a 360 view of the customer and to provide real-time marketing and campaign management capability and by back office applications like the product builder to provide product profitability.

The Temenos Front Office modules interact with channels via the Temenos APIs. To enable interaction of Temenos Front office solutions with third party providers, API gateways with in-built API management capability would be required.

Key frameworks underpin the Temenos Solution Architecture

The three frameworks linking user experience, record keeping (core banking and payments) and analytics/reporting, are **interaction**, **integration** and **data**.

Temenos Interaction Framework

enables simpler and easy access to the capabilities in the Front and Back Offices from the Channels and also for third parties via APIs.

Temenos Integration Framework

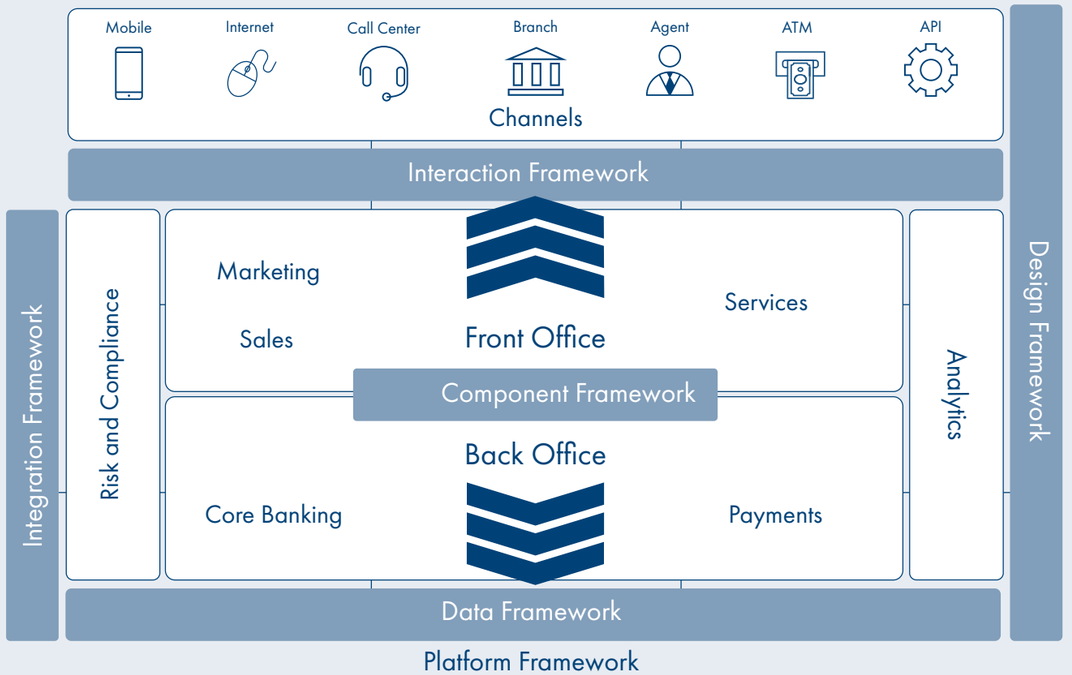
provides easier B2B integration capabilities through messages.

Temenos Data Framework

Separates reporting data from the more volatile transactional data and persists in column store tables for faster queries and near real-time distribution to the analytics and reporting solutions.

Temenos Component framework helps build the record keeping capability within Temenos. Temenos Design framework enables customisation and configuration to the core banking and payments applications. Temenos Platform framework enables middleware and database independence.

Figure 8: Temenos Solution Architecture



The Temenos Solution Architecture addresses all the key technological challenges posed by open banking and PSD2.

Security

Open banking and PSD2 place stringent new security demands on banks in terms of authentication, authorization, access control and non-repudiation. APIs are entry points into the bank's systems from and to the outside world. Therefore, a multi-level security framework is required to be in place to stop potential external cyber-attacks and unauthorized access. Even if one layer of security is breached, the bank's data must not be compromised.

Firstly, API exposure is limited to authorized entities only. Then, mutual authentication is required between the bank and the third party without the customer login credentials being shared with the third party – digital certificates are a way to ensure that both parties trust each other. OAuth 2.0 is one of the strongest authorization frameworks. Thirdly, the customer must consent to share information with the third parties before banks can share customer data. The customer can give this consent directly to the third party. When API requests are received by the bank, granular access control needs to be in place to ensure that third parties are given access only to the specific information that they have been authorized for.

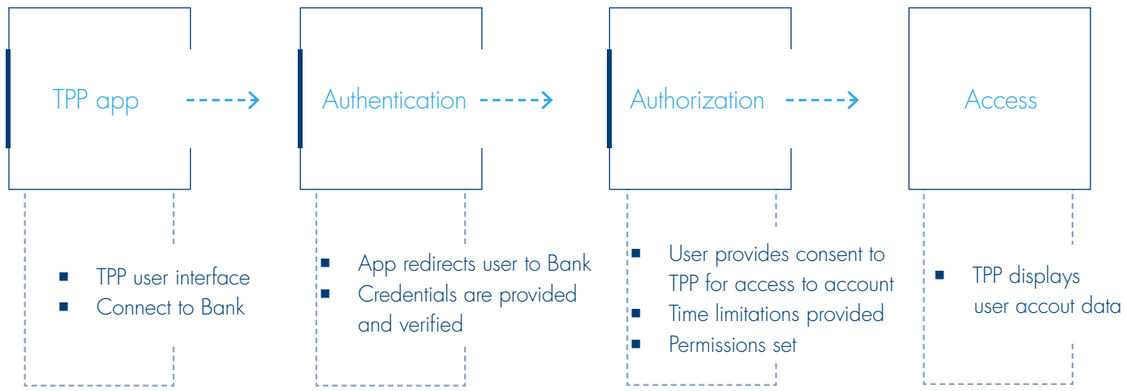
Temenos provides OpenID connect-based authentication support with third-party identity verification providers such as HID Global. Temenos promotes OAuth 2.0 and partners with a number of API gateway providers who support OAuth 2.0.

In the Temenos solution, when the consent comes with the account access request, it is recorded as an access right granted to the customer. The external user permission module holds the channel or third party identifier and the permission to access the specific data through that specific channel for a specific validity period. The bank can then issue a token for the third party to access the account without having to re-issue the token for every subsequent request in the same session. Thus, each time data is accessed, full access control is exercised at run time. Moreover, the request for access as well as response is logged in detail.

For AISPs, banks must provide ongoing access to account information where authorized i.e. even when the customer is not signed on. Temenos provides this account information in the form of 'push' messages (in the 'camt' message format) to the AISPs via B2B gateways.
Non-repudiation is a key requirement for open access i.e. banks must be able to demonstrate the authenticity of the messages or requests received from third parties so that they can prove that the message was received by the known authenticated third party. The API gateways would provide non-repudiation.

In summary, the Temenos solution comes with the required components and tools as well as with partner solutions to provide strong authentication, authorization, access control and non-repudiation services.

Figure 9: Authentication and authorization flow between the third party provider and the bank



Provision of open APIs and ISO-based messages

Temenos provides a complete set of open APIs for Xs2A (Access to Account). This includes providing access to basic account information, the available balance on the account and basic transaction summary, validating and accepting payment orders on an account, calculating the cost of executing the payment (charges, exchange rates and payment execution times), providing payment status and accepting cancellation of payment orders.

In addition to the Xs2A APIs, Temenos will also publish sets of APIs for the Retail, Corporate and Wealth product suites so that banks can exchange data across all banking products serviced by Temenos Core Banking. These APIs will provide details of standing instructions, direct debits and beneficiary details, creation and maintenance of corporate users, corporate group structures, negotiating exchange rates with the bank, viewing portfolio performance and initiating orders.
Temenos provides banks with the ability to extend and customize the pre-delivered APIs and to design and publish banks-specific APIs using the Temenos Interaction framework design-time tooling[6].

Temenos also provides ISO compliant message equivalents of the above-mentioned APIs using pain 001/ pain[7] 002 and camt[8] messages to perform payment initiation services and account information exchange respectively to meet the PSD2 requirements. These messages can be exchanged with third parties (both PISPs and AISPs) through the bank's B2B gateway.

Real-time availability of systems providing the data and processing payments

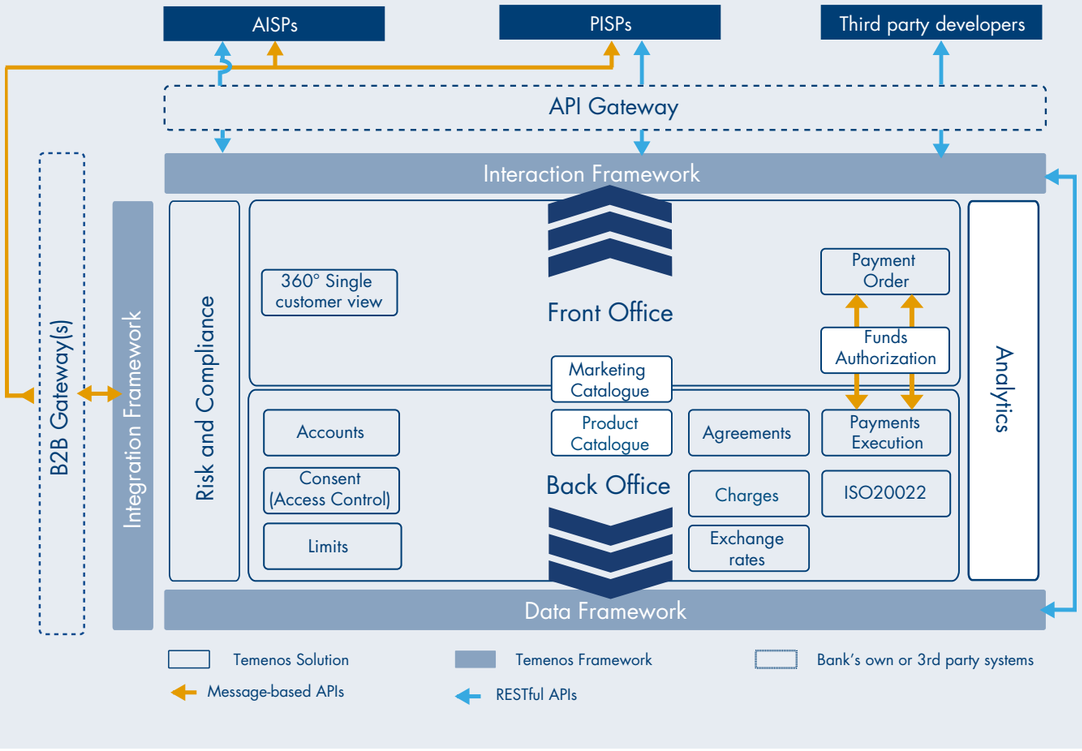
The Temenos core banking and payments solutions are fully non-stop 24x7. The Payments solution provides a real-time payments framework that accepts and executes payment orders in the order of seconds. These systems are highly available and have the ability to receive and process queries and valid transactions any time.

Scalability and Performance

The Temenos Data Framework allows banks to scale to higher query volumes and respond to requests by third parties in acceptable timeframes. Non-volatile reporting data is replicated in near-real time from the core banking system into a reporting database which stores data in columns rather than traditional rows. As a result, data is retrieved several times faster from the reporting database. Additional APIs to 'read' customer accounts, balances and transactions will access data from the reporting database rather than the operational database (of the core banking solution).

6 Temenos uses the Interaction Framework to build internal APIs for its own products
7 Payment initiation messages
8 Payments clearing and settlement messages

Figure 10: Temenos Level 1 PSD2 Solution



The Temenos PSD2 solution for Level 1 fully supports Xs2A and enable third-party payment initiation services. Account information flows between the bank and an AISP is implemented through REST APIs (when the customer is logged into the AISP channels), through 'camt' messages sent via the bank's B2B Gateway whenever there are balance changes and four times daily as recommended by PSD2. Payment flows between the bank and the PISP are supported via REST APIs as well as ISO 20022 message-based APIs per the PSD2 Regulatory Technical Standards. Payment messages are sent as 'pacs' messages via the B2B Gateway to clearing and settlement networks such as SEPA or instant payments.

Regarding security, the Consent Control module within Temenos Core Banking records and verifies whether the customer has given consent to the third-party, what data can be shared and for what duration. As explained earlier, authentication, authorisation, access control and non-repudiation are mandatory requirements for PSD2 which are fully supported in the Temenos solution and partner solutions for identity management and API Gateways.

Transparency requirements for PSD2 are handled by 'pain 002' messages or as REST APIs sent to the PISP, containing fees, rates and execution times to be applied when the request is received and the actual fees and rates approved by the customer after the payment is executed. All Temenos payment flows are compliant with SEPA instant payments.

One-leg transactions are identified by the Temenos Payments solution using the beneficiary/ordering institution country (BIC). Banks can configure the credit or debit value date of the payment depending on the currency of the payment and the beneficiary/ordering country of the one-leg transaction. In addition, currency and clearing holidays can be configured to set the correct current value dates.

Temenos Level 2 PSD2 Solution:

To monetize data access and to support their open banking initiatives beyond Level 1 PSD2 compliance, banks will require many more APIs across various banking products.

The 2018 Temenos product roadmap will include a Level 2 PSD2 solution. This will comprise the publication of an extensive set of APIs across the retail, wealth and corporate domains that banks can use off-the-shelf. Examples include basic customer information, account information, standing instructions, beneficiaries, direct debits, loans, deposits, mortgages, account movements, FX orders and negotiation of exchange rates.

As stated earlier, Temenos provides banks with the ability to extend and customize the pre-delivered APIs and to design and publish banks-specific APIs via the Interaction framework design-time tooling.

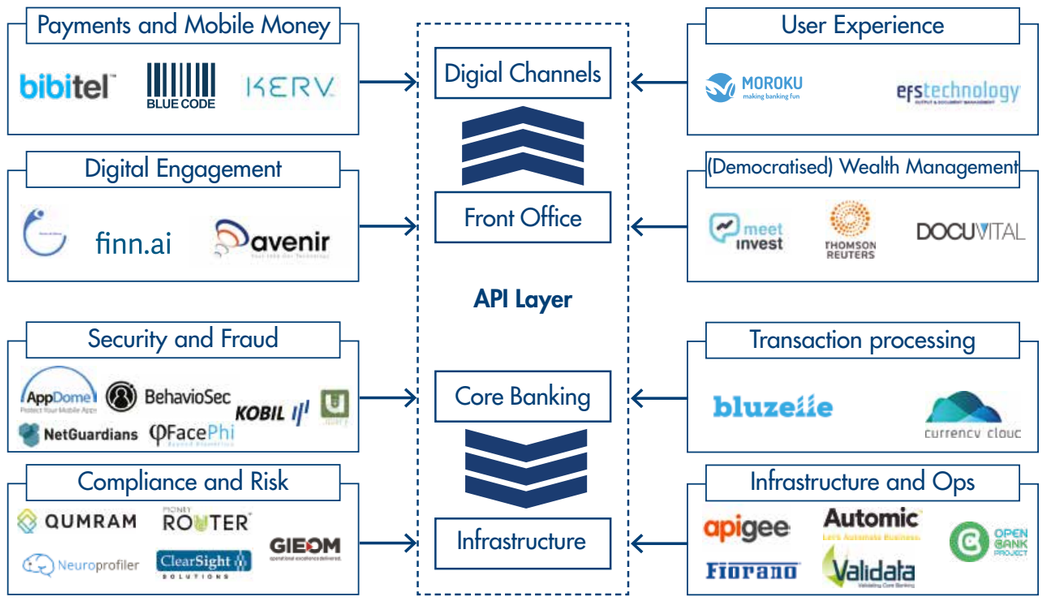
All APIs published by Temenos are based on REST architecture that prescribes rules for exchanging data between systems over the internet via HTTP protocol in accordance with prescribed standards such as the UK's Open Banking Initiative. The Temenos REST APIs will provide access to data and represent data as 'resources' in self-describing links using machine readable JSON format.

All Temenos APIs will be fully supported and protected through system upgrades i.e. new API versions will be released when new system features are enabled so that banks have the option to select the new features as and when they require.

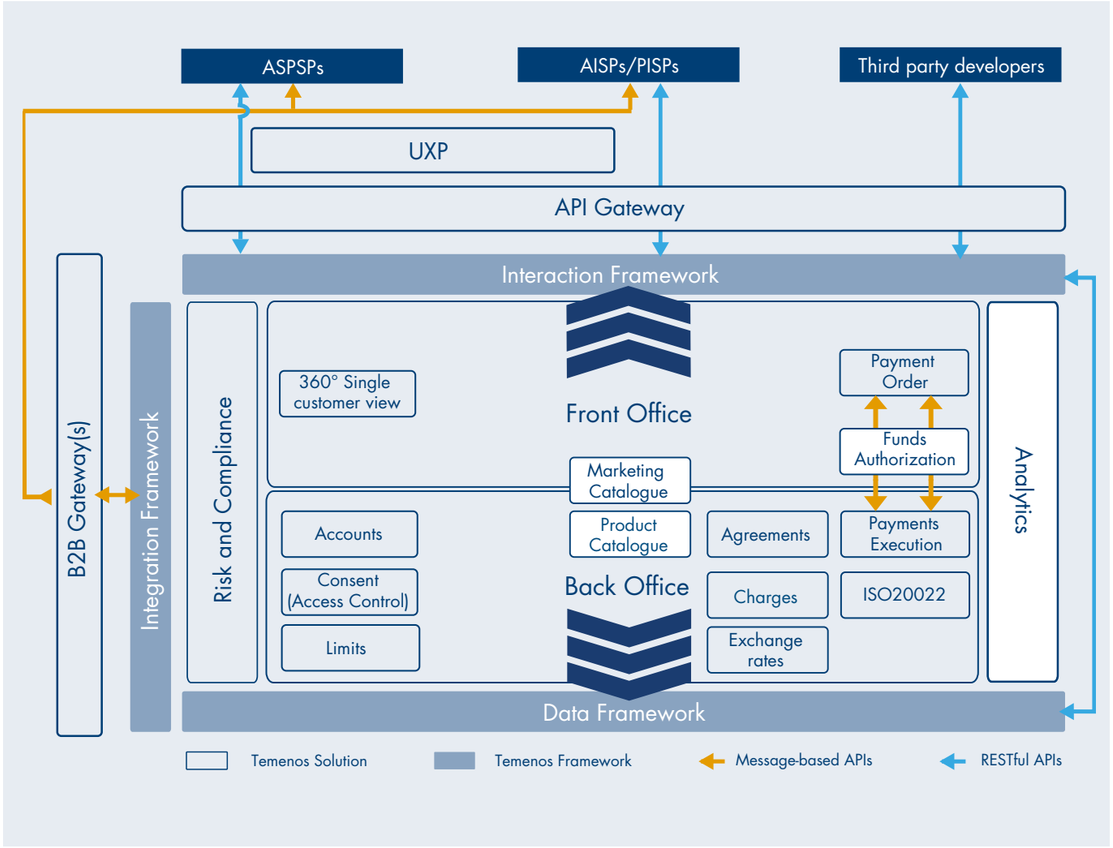
Temenos supports access to both open and shared data. Open data is data that anyone can access, use and share such as financial product information published by banks. Shared data is data that can only be shared with specific third parties that an individual or legal entity has provided consent to.

For banks that want to build API marketplaces, Temenos will provide the technology to build an API Developer Portal – a sign-up and self-service tool to target, assist and govern the community of developers who consume the open APIs. Consumers of APIs include mobile apps, third-party websites, chat bots and digital assistants. Full-lifecycle API Management will also be provided to aid the planning, design, implementation, publication, operation, consumption, maintenance and retirement of APIs. This includes the API developer portal as well as run-time management and analytics. Finally, monetization capabilities would be optionally available that include subscription, billing and user management.

Figure 11: Temenos Level 2 solution



Temenos Level 3 PSD2 Solution:



The Temenos stack enables banks to become AISPs and PISPs. The Temenos 2018 product roadmap will contain a Level 3 PSD2 solution comprising several Front Office components in order to capture customer and account information across multiple banks or financial services providers, and integrate with third party applications to receive the required information via APIs or messages. Apart from the basic services that the AISPs or PISPs will provide, the real value-add lies in the underlying data they possess about the end-customer and their behavior. This data can be collected, mined and analyzed using Temenos Analytics to create additional value-added services such as multi-bank Personal Financial Management (PFM), price comparison or the execution of payments instantly without having to go through clearing and settlement mechanisms to move funds between banks that are already connected to the payment initiation service provider.

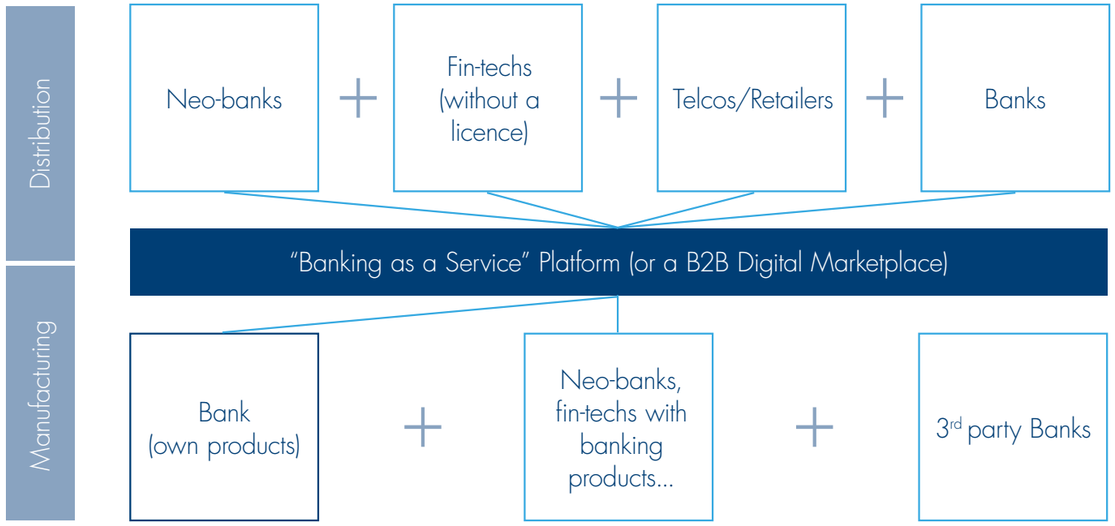
As with all Temenos software, the Temenos Level 3 PSD2 solution will be available on premise and on the cloud. The cloud offering will be a platform-as-a-service offering a turnkey solution comprising the entire Temenos stack as well as the API Gateway, the B2B Gateway, a solution for identity and access management and adapters to integrate to third party core banking systems. This will be a secure, scalable and agile platform offering a wide range of additional plug-and-play services from trusted third party providers so that banks can further leverage their data assets and achieve deeper and better engagement with their end-customers.

Beyond PSD2: the Emergence of Platforms in Banking

The EBA Open Banking report[9] mentions that open banking and PSD2 will lead to the eventual creation of banking platform business models Platforms generate value by facilitating the exchange, provision and delivery of financial products and services between multiple suppliers and consumers, leading to improved customer experience, innovation and growth. Open APIs have a network multiplier effect by expanding the number of products and services that can be created and consumed. All platform value propositions are predicated on the advanced analytics capability that the platforms own and provide to all parties.

API-based plug-and-play technology architectures in banking can support different platform business models – manufacturers, distributors or B2B platforms (See Figure 2).

Figure 13: Example of a B2B Banking as a service platform



In the same way as open banking is expected to bring platform benefits to consumers and financial services providers alike, the Temenos offering will bring platform benefits to the providers of financial services software. It will facilitate collaboration between banks and third parties, allowing any financial services provider, whether a distributor, a manufacturer or a platform, to offer a rich, personalised experience for the end-customer. Temenos will be a feature-rich, secure and scalable platform offering both Front Office and Back Office as a service. The Front Office platform as a service will include an open product catalogue that records all banking and financial products that can be sold to customers as well as advanced data aggregation and analytics on the customer's profile, profitability, current holdings and behaviour, mined in real-time to reveal new insights. These in turn will lead to more personalised and proactive product recommendations, more targeted customer segmentation, enhanced fraud detection.

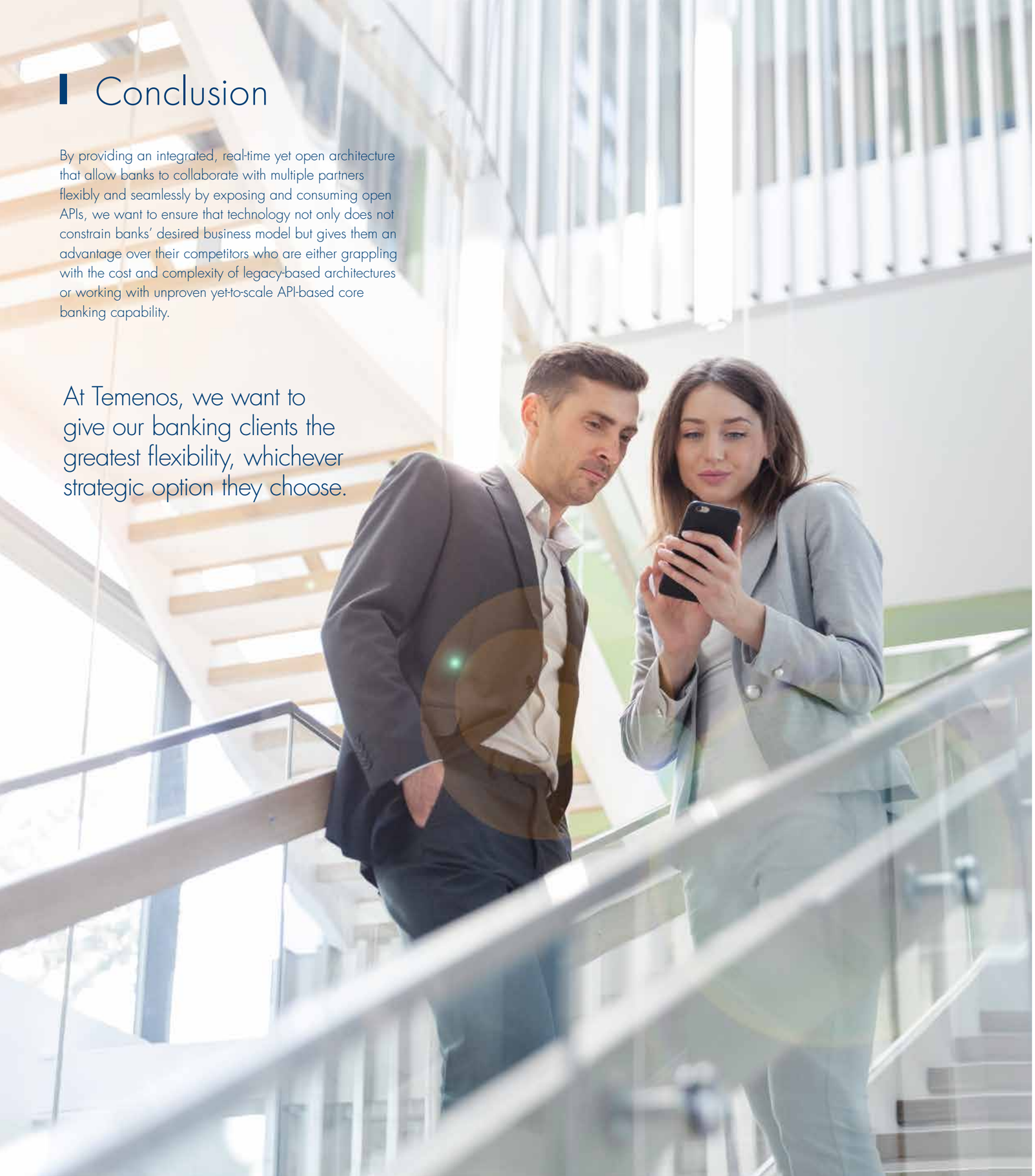
The Back Office platform as a service will provide advanced product configuration and servicing capabilities that allow seamless integration with third party products, as well as real-time straight-through processing and risk management.

9 EBA Open Banking Advancing Customer Centricity March 2017 Analysis

Conclusion

By providing an integrated, real-time yet open architecture that allow banks to collaborate with multiple partners flexibly and seamlessly by exposing and consuming open APIs, we want to ensure that technology not only does not constrain banks' desired business model but gives them an advantage over their competitors who are either grappling with the cost and complexity of legacy-based architectures or working with unproven yet-to-scale API-based core banking capability.

At Temenos, we want to give our banking clients the greatest flexibility, whichever strategic option they choose.



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Next Steps

Find out more about how you can easily implement and benefit from real-time payments.
Contact us at info@temenos.com

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Temenos AG (SIX: TEMN), headquartered in Geneva, is the world's leader in banking software, partnering with banks and other financial institutions to transform their businesses and stay ahead of a changing marketplace. Over 3,000 firms across the globe, including 41 of the top 50 banks, rely on Temenos to process both the daily transactions and client interactions of more than 500 million banking customers. Temenos offers cloud-native, cloud-agnostic front office and core banking, payments, fund management and wealth management software products enabling banks to deliver consistent, frictionless customer journeys and gain operational excellence. Temenos customers are proven to be more profitable than their peers: over a seven-year period, they enjoyed on average a 31% higher return on assets, a 36% higher return on equity and an 8.6 percentage point lower cost/income ratio than banks running legacy applications.

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