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European Technology

Banking Software Primer

Industry Overview

Supporting banks' core IT

In this Banking Software Primer, we detail the structure of the global Banking Software market, the main dynamics driving growth and adoption and the primary challenges to continued growth. We review the competitive dynamics across segments and highlight the positions of key competitors in the environment, from incumbents Temenos, FIS, Fiserv, Jack Henry, Finastra, Oracle, to new competitors including Mambu, Thought Machine and 10x.

Rise of digital banking drives banking software rethink

Core Banking Software (CBS) was originally designed as an internal tool to reconcile accounts to allow customers to bank across different branches. With the advent of digital banking, both customers (retail and business) and Fintech companies increasingly interact with CBS systems directly and via a variety of channels (web apps, mobile apps, etc.). As a result, the CBS architecture has become a critical strategic consideration for banks in an increasingly crowded competitive landscape.

Growth drivers: banks' revenues & move to 3rd party

We believe the main growth driver for the global banking software market is the increase in banks' revenues, boosted by normalised interest rates until at least 2025. We expect revenue growth to result in more firepower to invest in technology and undertake large-scale migration projects. We estimate the global banking software market generated nearly $59bn in 2022, up from $41bn in 2016. We expect the Total Addressable Market to continue to expand, growing at a 5.5% CAGR to 2026. We also believe the trend in outsourcing banking software responsibilities will continue. We expect third-party spending to grow to 29.3% in 2025 from 27.8% of the total in 2016. We believe it will continue to outgrow internal spending, with 7.0% and 4.9% CAGRs, respectively, in 2022-2025E.

Competition: FIS & Fiserv lead, life harder for newcomers

The banking software market is fragmented, with three types of competitors: (1) incumbent leaders with comprehensive banking offerings (FIS and Fiserv) – they share c.60% of the Banking software market; (2) CBS-focused incumbents (Finastra, Jack Henry, Temenos, Oracle and Infosys) – they provide banking software platforms to financial institutions, with the focus on a designated segment, sector, geography or technology; and (3) specialised new entrants (Mambu, Thought Machine, 10x, etc.) – they have a modern tech stack and high growth but have a <2% combined share, with higher interest rates and profitability requirements as limiting factors.

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Rise of Digital Banking puts new focus on Banking Software

Core Banking Software (CBS) was originally designed as an internal tool to reconcile accounts to allow customers to bank across different branches. With the advent of digital banking, both customers (retail and business) and fintech companies increasingly interact with CBS systems directly and via a variety of channels (web apps, mobile apps, etc.). As a result, CBS architecture has become a critical strategic consideration for banks in an increasingly crowded competitive landscape.

Banking is undergoing a major transformation. IT and big data along with highly specialised human capital continue to put the squeeze on physical branches – exacerbated by the COVID-19 pandemic. Traditional banks now face greater competition than ever before, not only from neo-banks but also from entrants in adjacent industries, i.e., fintech, big tech, payments, etc. Digital native competitors are also snapping at the heels as consumers increasingly adopt digital behaviours, resulting in higher expectations for banking services (user friendliness, availability, speed, etc.). As a result, digital disruption is threatening to leave several incumbents struggling to deliver the standards of service that new competitors can provide as they are stuck with obsolete legacy technologies (i.e., mainframes) and overextended branch networks.

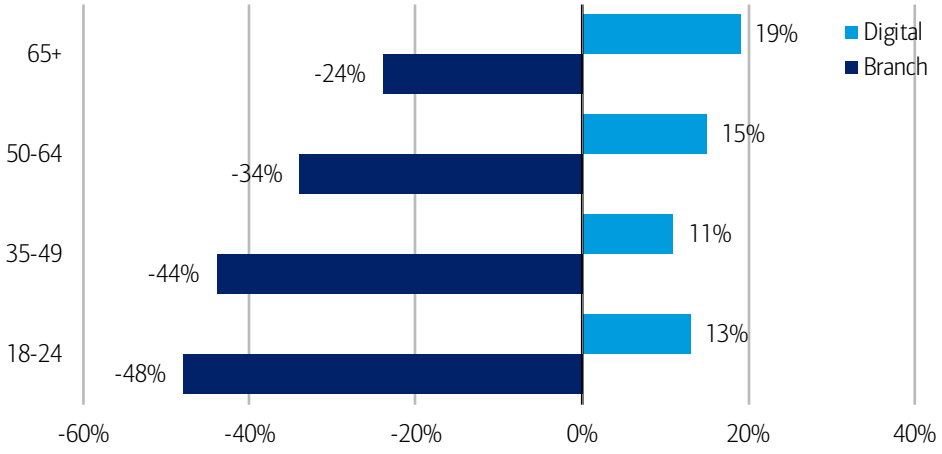
Digital banking revolution

Evolving consumer behaviour

Online & mobile banking are the new normal

Prior to COVID-19, the dramatic shift in banking channel preferences towards digital had already begun. Across all age groups, branch usage declined 38% on average over the previous five years, while the number of digital interactions rose by 15%. This change was most pronounced within Gen Z (18-24 year olds), where branch usage dropped nearly 50%.

Exhibit 1: % Change in quarterly channel usage by age group (2015-2020)
Branch usage decreased across all age groups (-48% for 18-24) whilst digital usage increased (+19% for 65+)



Source: Deloitte Digital, Digital Banking Redefined in 2021

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This shift accelerated during the pandemic, with customers turning to remote channels (remote advisors and contact centres) and digital channels (mobile apps and online banking). Net usage of remote advisors and contact centres increased +7%, but soared +30% for mobile apps and +23% for online banking.

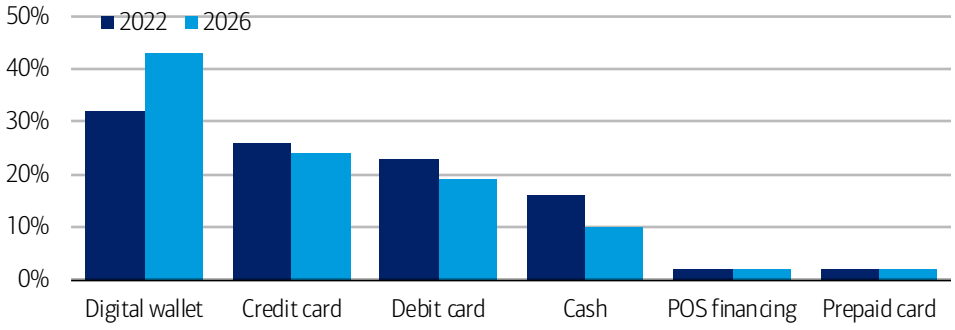
This acceleration was driven partly by older generations (50+) with lagging preferences "catching-up". For generations used to in-branch visits and cash payments, new norms of social distancing, lockdowns and bank closures forced the adoption of mobile and online channels to access banking and payment services. We also note a correlation between the age of users and the rate of adoption of digital services: the older the individual, the more analogue the payment method, the greater the adoption of digital during the COVID pandemic.

We believe these shifts will outlast the pandemic, with an additional net increase of +19% in mobile banking and an additional net reduction of -26% in branch usage, based on our forecasts. We believe the c.89% of UK consumers who used the Internet for online banking/money management in 2021 will continue to do so; we also expect this number to increase YoY.

Rise of digital/mobile payment methods

The sharp acceleration of e-commerce and accompanying decrease in cash usage have favoured the emergence of new payment methods. Digital/mobile wallets became the number-one payment method in 2020, accounting for c.26% of transactions worldwide – payment this way is set to increase by c.30%, accounting for c.33% of global transactions in 2024, according to Worldpay's 2021 Global Payments Report.

Exhibit 2: Global POS payment methods in 2022 and 2026 (forecasted)
Cash transactions expected to decrease sharply by 2026 to c.10% of global payment methods



Source: Worldpay from FIS, 2023 Global Payments Report

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The rise of digital assets & cryptocurrencies – $2tn+ market value and 200mn+ users

The digitisation of the banking sector is driven not only by new ways of banking, but also by the nature of the financial assets themselves. The digital asset universe is expanding quickly, with a $2tn+ market value and 200mn+ users (see BofA's Digital Assets Primer). We believe crypto-based digital assets will form an entirely new asset class. Bitcoin is significant, but the digital asset ecosystem encompasses more technology: tokens that act like operating systems, decentralised applications (DApps), stablecoins pegged to fiat currencies, central bank digital currencies (CBDCs), and non-fungible tokens (NFTs) enabling connections between creators and fans. This is helping create a new generation of companies for digital assets trading, offerings and new applications across industries, including finance, supply chain, gaming and social media.

Development and adoption of digital assets will likely be led by Gen Y, Millennials and Gen Z. These generations grew up with the internet and expect native internet transactions to be frictionless and digital. Digital asset growth is likely to continue, as it enables customers to simply and easily transfer value and make payments (PayPal, Venmo and Zelle). It is also real-time and eliminates the middleman (or at least makes the transaction less cumbersome if using a digital asset exchange like Coinbase). It is estimated that 14% (21.2mn) of US adults owned digital assets and a further 13% (19.3mn) plan to buy digital assets in 2021. Notably, the average age of these potential buyers is 44 and 53% of them are female (according to the Gemini 2021 *State of the US Crypto Report*).

Changing landscape of financial sector: IT is key

Demand drivers (i.e., on the consumer side) have gone hand in hand with digitalisation of the banking industry on the back of supply factors, specifically the emergence of banking APIs (Application Programme Interface – a tool that enables software to communicate and perform tasks) regulated by PSD2, which institutionalised the unbundling of financial services and codifies the status of neo-banks and Fintech companies.

Technological advances: APIs, fintechs, and the revolution of banking

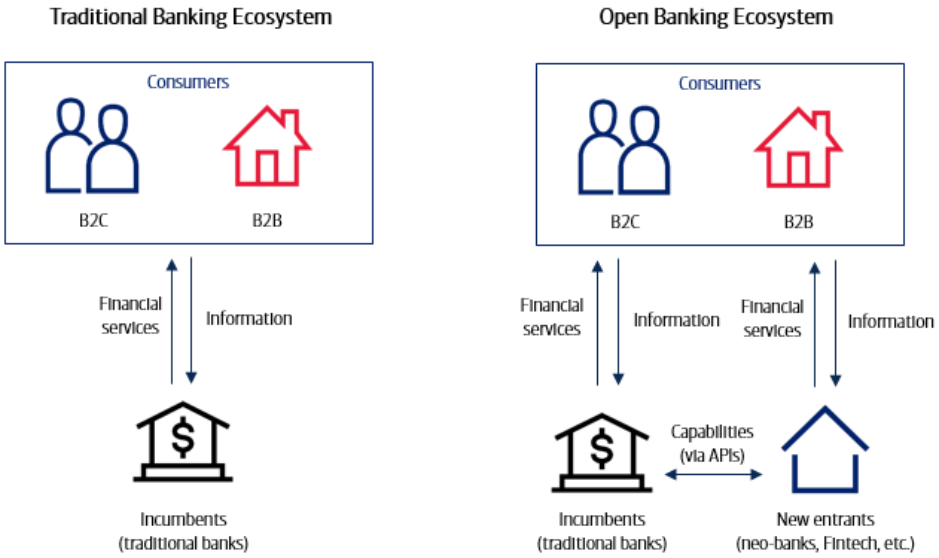
APIs in banking: the rise of the fintech and unbundled offering

Traditionally, customers have turned to banks as their primary provider of bundled financial services. The past decade has been transformative for the industry, notably due to the introduction of APIs. Traditionally, APIs have facilitated a third-party application to synchronise, connect and exchange data with another operating system.

APIs have proven a quick, convenient and cost-effective connection to third-party applications developed by fintech companies to bring their offerings to consumers. Unlike incumbents' traditional business model of bundled services, these agile challengers offer quick and convenient specialised services (i.e., budgeting, payments, crypto, etc.).

Fintech firms have notably taken advantage of unmet customer needs in payments and transfers (such as international remittances), credit, and investment advice. This has resulted in an unbundling of financial services whereby numerous providers (incumbents and new entrants) offer a plethora of services to consumers.

Exhibit 3: Traditional banking ecosystem vs. Open banking ecosystem
PSD2 codified status of new entrants who compete with incumbents but also collaborate via APIs



Source: BofA Global Research
Note: This graphic is non-exhaustive and over-simplifies the complexity of the banking ecosystem for illustrative purposes

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Today, we are seeing a surge in partnerships and collaborations, with banking products and services being rebundled via a platform where users can satisfy various financial needs. The actual provider of any one service is less critical than the banks' control of touchpoints and the overall improvement of customer satisfaction.

Banks are now using fintech APIs to keep up with increasing customer expectations for digital services and capabilities. A banking institution's customer app is a common

example – these platforms often connect with third-party APIs to provide services like credit score updates and mortgage tools along with standard account access.

The spread of APIs has also resulted in Banking as a Service (BaaS) systems, whereby BaaS APIs provide third-party fintech companies with direct access to banking data (with authorisation from the consumer as dictated by PSD2 regulation – see next section). In this arrangement, a fintech company pays to hook into an institution's banking platform and creates new offerings. For example, companies tie into banking APIs to deliver personal finance apps, offering budgeting and spending tracker functionalities as well as investment recommendations.

Regulating APIs in banking: open banking, PSD2 and the legitimisation of neo-banks & fintechs

PSD2 & open banking

PSD2 in brief:

- Date effective: January 2018
- Legal status: EU law
- Jurisdiction: EEA
- Goal: Create a European "Open Banking" ecosystem that is competitive and secure
- Main provisions: (1) creates statuses for fintech companies and codifies data sharing rules between new entrants and traditional financial institutions; and (2) creates enhanced customer protection via Strong Customer Authentication (SCA, also known as "two-factor authentication")
- Implications for payments market: the regulation significantly lowers barriers to entry for fintech companies to operate in the banking market

In 2013, the European Commission published a proposal for the revised version of the Payment Services Directive (PSD1), known as PSD2, which involves the concept of data ownership by the consumer. PSD2 allows third-party providers (TPPs, i.e., fintech companies) to access banks' data and accounts – based on the very rationale that those data and accounts are owned by the consumer rather than the banks. However, to protect consumers' interests and data, this can only happen once the consumer grants permission for the specific action to be performed. PSD2 also gives strict guidelines on how new providers obtain permission from consumers to access their accounts. The second PSD was approved in 2015 and Member States had until 13 January 2018 to implement it into national law.

Repercussions for the banking market: legitimisation of fintechs and neo-banks

By establishing regulated statutes for fintech companies and codifying cooperation with traditional financial institutions, PSD2 acknowledged the changing nature of the payments landscape in Europe. Indeed, these regulations provide a solid regional legal framework to accommodate (1) the growth in online and digital banking; (2) the use of internet and mobile payments; (3) the rise of new technological developments; as well as (4) a trend towards customers having relationships with multiple account providers.

Client is king – as well as digitally native and picky

The rapid digitisation of financial services and resulting crowded ecosystem of providers has significantly lowered switching costs for consumers and established banks' traditional monopoly is being eroded as new entrants attempt to lure customers away.

This renewed competition for customer acquisition and retention is even more intense with digital-native generations, i.e., 33% of 18-34 year-olds look to change banks within the next six months vs. 8% of those over 55.

Younger digital natives have vastly different expectations of banks' digital performance from their elders: they expect a seamless and intuitive user interface (UI) and experience (UX), enabled by real-time transacting capabilities of internet-connected devices. According to the 2019 Gartner Customer Experience Survey, 62% of consumers comparing financial services experiences think those provided by banks should be as good as those provided by non-financial-services providers (such as Apple Pay, Amazon and Netflix). Another 29% expect that financial services experiences should be better than those of other brands.

With Deloitte Digital finding that the #1 attrition driver for banks is a poor app, the digital customer experience is at the heart of a bank's retention strategy. However, those players have vastly different technological capabilities and are not all capable of delivering a customer experience that matches expectations. Incumbents that have been providing banking services for 50+ years have a multitude of systems integrated by technology developed at the same time as well as an overextended network of physical branches, which is not only costly but increasingly obsolete.

On the other hand, neo-banks and fintech providers emerging in the past decade have adopted cloud-native, lean systems that not only comply by design with modern regulation, i.e., customer authentication requirements of PSD2, but also seamlessly integrate external APIs and extract customer behaviour insights, using nascent technologies such as artificial intelligence (AI) and Machine Learning (ML). This type of player is therefore much better placed to provide the state-of-the-art UI and UX expected from digitally aware customers.

Evolution & main debates

Where are we now and how did we get here?

We present a short history of banking software to contextualise the current landscape where incumbent banks with outdated "spaghetti" legacy systems face competition from neo-banks and fintech service providers with much more recent, leaner and adaptable back-end systems. Additionally, all the aforementioned competitors face the choice of whether to keep developing and modernising those systems in-house or to outsource this critical task to a specialised third-party provider.

A short history of banking software: four generations of systems

We identify four waves of technological and regulatory change that have shaped the banking software industry.

1. **1970-1980s: original Core Banking Software (CBS) systems are built**: Traditional core banking systems emerged in the 1970s-1980s as emerging computer technology allowed digitisation of centralised general ledgers. To enable customers to transact in any branch, banks placed all their key systems and data on a single machine to achieve the speed of inter-brand communications that was required. As a result, these systems were monolithic in style and exclusively designed to run on expensive mainframes.

2. **1990s: rise of multichannel banking:** In the 1990s, the popularisation of ATMs and call centres as well as the emergence of online banking resulted in a second generation of core banking systems. As consumer banking evolved to become less branch-centric, banks invested heavily in retooling banking systems to achieve high resiliency and handle significant throughput at low latencies. However, the underlying architecture of the core banking systems remained largely unchanged, resulting in systems that were costly to run.

3. **2000s: online banking revolution:** At the turn of the century, rapid adoption of mobile banking drove the requirement to build systems for 24/7 banking. In the wake of the Global Financial Crisis (GFC), banks faced mounting pressure to drive down the costs of their IT infrastructure, as well as to adapt to shifting consumer expectations and increasingly stringent regulator demands. Basel III, for example, placed increasing demands on banks that directly clash with the traditional end-of-day batch processing, such as the requirement of intraday liquidity management. To address the 24/7 requirements, banks changed systems to run in "stand-in" mode so that payments are buffered as the bank transitions over the end-of-day process. This approach added considerable complexity to the system as banks found themselves building a bank within a bank to handle stand-in. To meet the changing consumer and regulatory demands, some banks developed new features and products using modern programming languages, which paved the way for banks to ditch their expensive mainframes. These systems still use batch-based processing and continue to be monolithic.

4. **2010 – present: open banking is digital:** The convergence of online and mobile banking with social networking and payments gathered pace as a result of COVID-19 – the digital customer experience is critical to customer acquisition and retention. In Europe, PSD2 regulation not only lowered barriers to entry for fintech companies and third-party providers but also established regulations with repercussions for core banking systems (i.e., via enhanced security measures such as Strong Customer Authentication). As a result, neo-banks with much leaner core banking systems have emerged and are increasingly taking share from incumbents who are not only legally bound to share customer data with them, but must also ensure their core systems are capable of synchronising, connecting and exchanging this data with third-party applications.

Exhibit 4: Drivers of banking software technology development since 1970s
Banks have had to develop and adapt core banking software to four different generations of technological and regulatory changes

	Industry change (demand drivers)	Technology change in Banking Software (offer drivers)
1970s-1980s	Digitisation of Banking systems. Bank of Scotland offers customers first Internet banking service in 1985.	Core banking systems are built to emulate brick-and-mortar branch model. They provide only basic functionalities for core banking transactions and are primarily product centric and developed in silos.
1990s-2000s	Emergence of new banking channels i.e. ATM & call centres. Popularisation of online banking.	Development of new core banking systems that are flexible and customer-centric. Multi-channel processing/integration and adoption of service-oriented architecture. Underlying architecture remains largely unchanged, resulting in systems that are expensive to run, especially given they have to be sized for peak processing
2000s-2010s	Rapid adoption of online and mobile banking behaviours driven by increase of multi-channel platforms. Emergence of big data, analytics, cloud-based platforms.	Banks start to focus on customer centricity and look towards agile core banking solutions. Higher investments by banks into core architecture due to tighter regulations. Renewed focus on risk management.
2010s-2020s	Convergence of online banking, social networking, payments, and mobile. Rise of "Open Banking" with PSD2 Regulation. COVID-19 pandemic accelerates digitisation of consumer behaviour.	Convergence of online banking, social networking, payments, and mobile: need for banks to overhaul legacy systems for supporting fast-growing digital services and better integration of channels. Banks undertaking massive transformation of their IT architectures for new core banking solutions which will be scalable, adaptable, agile and economical.

Source: BofA Global Research

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Where are we now?

Traditional banks with legacy "spaghetti" systems

Incumbent banks continue to function with legacy banking platforms created in the 1970s, updated on an ad-hoc basis to keep up with the rapid digitisation of the industry. Decades of M&A have exacerbated the issue as disparate, incompatible back-end systems collide, resulting in tangled interconnected systems and applications within a bank's technological stack.

As CBS technology evolved, banks that did not want to risk moving away from their mainframes began to adopt a "hollow out of the core" strategy, which involved pulling the product engine, along with other key capabilities, out of the core. The result is that banks can rely on more modern products to solve some of the shortcomings of the legacy core. However, the downside is the increased operational complexity and integration challenge. Additionally, the proliferation of these tactical systems causes data silos, which make it harder for banks to satisfy changing consumer behaviour and regulatory requirements.

As the world enters the cloud generation, legacy systems are nearing an evolutionary dead end and are in urgent need of modernisation. They are thwarting the incumbent banks in the following ways:

1. **Increased complexity and multiple, interrelated points of failure**. Ultimately, software systems are deterministic in nature. Nonetheless the complexity of these systems led to black boxes where outcomes were unpredictable.

2. **Data silos**. Most clever workarounds involve building systems that interface with the core. There are situations where the mobile banking and internet banking platforms had separate customer management layers instead of one unified layer. This can lead to dispersed customer data, preventing banks from having a single view on their customers. Some banks created centralised customer management systems as a workaround to this workaround.

3. **Increasing costs**. Since these systems are monolithic, the only way to scale is vertically, i.e., by adding more server capacity. In terms of cost, this also requires pre-sizing growth requirements and paying for capacity that is not needed in advance.

4. **Technical debt with time slowed down by pace of innovation.** Initially banks launch products and grow, although with time the pace of innovation grinds down due to the volume of technical debt that is still owed by the entity.

Neo-banks' agile core system...until it isn't

Neo-banks have the advantage of not having inherited the complex back-end systems that are such an impediment to incumbents. They have also taken advantage of shifting consumer behaviour and built completely digital business models, saving on the cost of online branches. As a result, their core banking systems are a key component of their competitive strategy and have been developed as a flexible and stable API-first architecture, which allows (1) a seamless customer experience; and (2) rapid rollout of new products and services.

This is exemplified by neo-banks and e-money institutions, such as Revolut. Its platform not only allows customers to take advantage from the constantly expanding breadth of its offering (ease of opening a multi-currency account, lower fees, digital cards and wallet, spending visualisation, crypto and stock trading, etc.) but also provides customers with full control of their banking experience: they are free to personalise every aspect of their account from security preferences (enable NFC or magnetic stripe payments) to setting customised alerts (i.e., for crypto and commodities volatility).

However, no banking system is truly future-proof. As technological advances, regulatory frameworks and consumer behaviours evolve, so will the requirements of banking software systems. New entrants will enter the market with more innovative platforms better adapted to the environment and today's neo-banks will have to update their own legacy systems. This has been the case in other sectors (e.g., Facebook's migration from MySQL 5.6 to 8.0 taking >1y) and we believe CBS is no different.

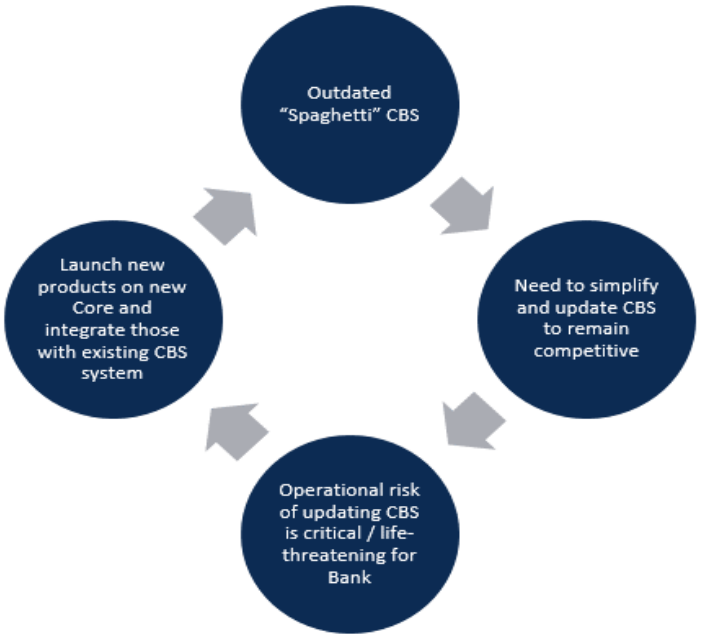
What are the main debates in the sector?

Debate #1: technical debt & the spaghetti loop migration dilemma

One major debate involves the migration of Tier 1 banks on modern core systems, with industry experts disagreeing about every aspect (the timeframe of a potential migration, whether it will happen at all, and whether it should be done in-house or outsourced to a third-party).

Technical debt has become a vicious cycle, whereby the critical risk associated with CBS update/migration acts as an incentive for banks to launch new products and capabilities on new core systems, themselves integrated with the existing core systems. This adds an additional layer of complexity to the already complicated system of core software, thereby increasing again the cost and risk of migration for the bank. As a result, it is nigh on impossible for Tier 1 banks with decades of system integration (further complicated by M&A integration) to migrate existing systems onto a new, simplified and unified core.

Exhibit 5: CBS migration vicious cycle
Critical risk associated with CBS update results in additional complexity in CBS



Source: BofA Global Research

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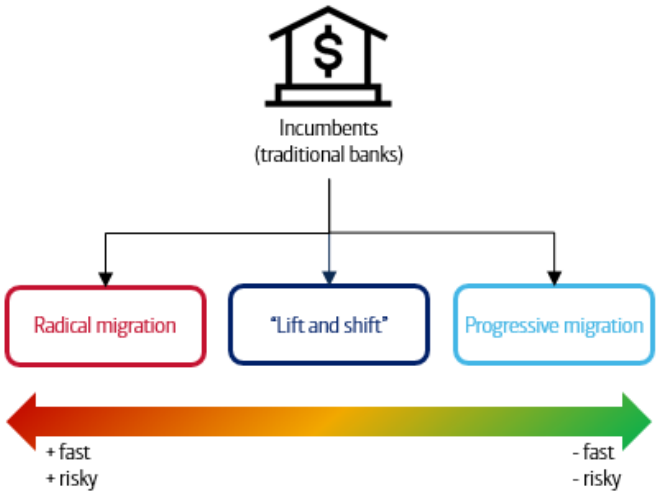
Because of this vicious cycle, we believe that core migration is a process that banks can only delay for so long before it significantly impedes their ability to compete with digital-native competitors. We also believe that most big banks have reached the same conclusion and have announced migration programmes for at least for some business lines, i.e., JPMorgan Chase and Lloyds for retail banks. Nonetheless, given the high financial costs and risk of failure, and the associated disastrous consequences, internal IT departments are often reluctant to implement large-scale core migration.

Broadly speaking, there are three sets of strategies to migrate core banking systems: (1) radical migration; (2) "lift and shift"; and (3) progressive migration. The first is typically considered far too risky for medium and large banks that have very complex legacy systems, although the other two methods also carry high financial costs as well as operational risks.

Exhibit 6: Strategies to migrate core banking systems for incumbent banks
Radical migration is fastest but riskiest, progressive migration is least risky but longer



Source: BofA Global Research

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1. Radical migration: suitable for smaller, less complex banks

This approach consists of full replacement of systems at once. The advantages are the speed of execution and potential payback given the corresponding lower cost. Successful examples include Bank Oromia of Ethiopia, Bank SinoPac and Bank of Shanghai. However, the risks associated with shifting the bank's books and ledgers to a new system in one go are much higher than those involved in the "lift and shift" and progressive approaches. The risk of failure and associated reputational damage is immense.

In 2018, TSB bank, acquired by Banco Sabadell, attempted to migrate its customer accounts to a new core system. The project was originally meant to take 18 months but ran behind schedule and reportedly over budget. Overall, 1.3bn customer records were corrupted in the migration – from missing life savings to tiny purchases incorrectly recorded as costing thousands, and customers presented with other people's bank accounts. Additionally, the bank's IT systems took weeks to recover, and millions of people struggled to access their money.

This failure triggered reviews by a number of financial regulators as well as a UK parliamentary inquiry. TSB reported a £105m loss in 2018 (vs. a £163m profit the previous year) with post-migration costs including compensation for customers, correction of fraudulent transactions (which surged in the chaos and confusion of the outage) and hiring of IT assistance – which together cost £330m. As result, this option tends to be the least favoured due to the relatively high probability of failure and correspondingly high costs (financial, reputational, etc.).

2. "Lift and shift": a relatively new approach, made possible by the modular nature of the software

This involves setting up the equivalent of a business on a modern core and progressively migrating customers from the old core to the new one. The time to full migration is typically longer than the radical migration process, but reduces the associated risk of failure significantly. The cost of the project also tends to be more predictable than with both the radical and progressive migrations. However, this is a costly approach that requires a bank to run two platforms at once for the same product until the migration is complete. Israeli bank Leumi with its Pepper brand and Canada's EQ Bank are adopting this strategy.

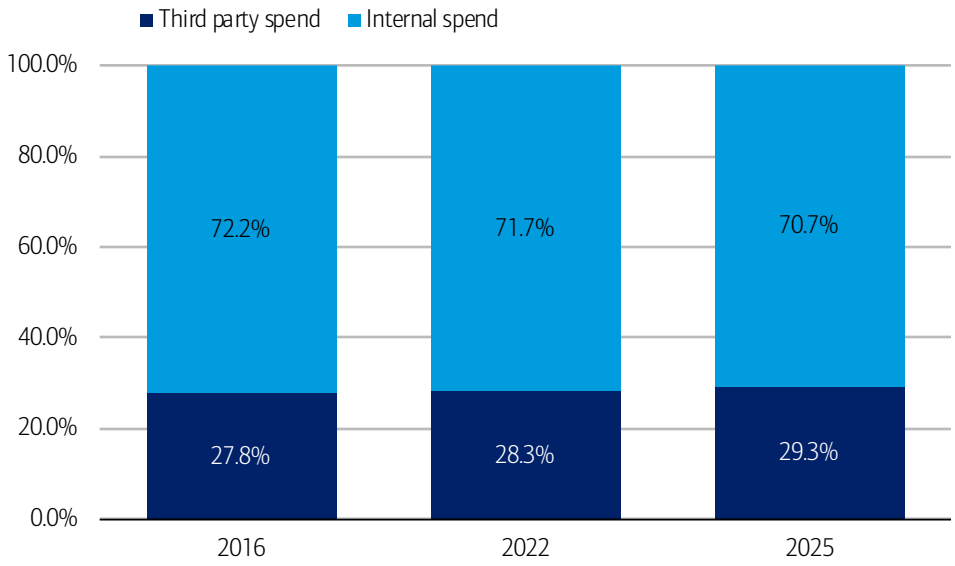
3. Progressive migration: lower risks and early business benefits – suited to bigger banks like Nordea, KBC and Bank of Ireland

This approach is typically tailored to individual banks and consists of migrating a product type (vertical) or business function (horizontal) sequentially. For example, "back-to-front" migration replaces back office first and delivers quick value whilst protecting the interaction with the bank's customers. "Front-to-back" provides an early upgrade to the customer experience with improvements to operational flexibility and efficiency following at a later stage of the project. This decision is typically influenced by the nature of the organisation: i.e., big banks tend to have very complex IT infrastructure, so vertical migration – product offering migration – tends to make sense in this context. Though typically considered safer than the first alternative, this method is often lengthy as well as expensive. Bank of Ireland used progressive migration for its "Project Omega" modernisation plan that kicked off in 2016. Originally planned to last five years and cost around €500m, its budget was extended to €900m and then to €1.4bn in 2018, including an extra €250m allocated for business restructuring, with the final price tag estimated at close to €2.0bn.

Debate #2: updating the core – in-house developing or third-party outsourcing?

With incumbents and neo-banks around the world spending millions of dollars to migrate, adapt or simply maintain their core banking systems, a key consideration is whether they do this in-house or outsource to specialised third-party providers.

Exhibit 7: Banking Software Total Addressable Market (TAM): Internal vs. Third-party spending
Internal/third-party spending split expected to move from 72%/28% in 2016 to 71%/29% in 2025



Source: BofA Global Research estimates

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Currently, we estimate that 72% of the CBS market is captured by internal spending (vs. 28% third-party spending), although we expect this to reduce to 71% by 2025. This is mostly driven by large banks with significant IT budgets favouring CBS development, maintenance and migration in-house because they face unique challenges:

- **Integration problem:** Banks expect new CBS facilities to integrate with their existing stack of channels, customer-relationship-management systems, data architecture, risk systems, and middleware. All of these are difficult to replace and represent hundreds of millions of dollars of investment over the years, meaning they cannot be written off without significant disruption and losses. The problem is that this integration entails high risk and high cost. The incumbent core banking

system has usually undergone significant customisation and development, reflecting changes in business logic over decades. Untangling the integration from the old system and re-integrating the new core banking system is such a complex exercise that those banks usually have a significant number of developers whose full-time work is understanding this architecture to test, migrate and update it. Usually third-party providers simply lack the firepower to provide a similar service for a single client.

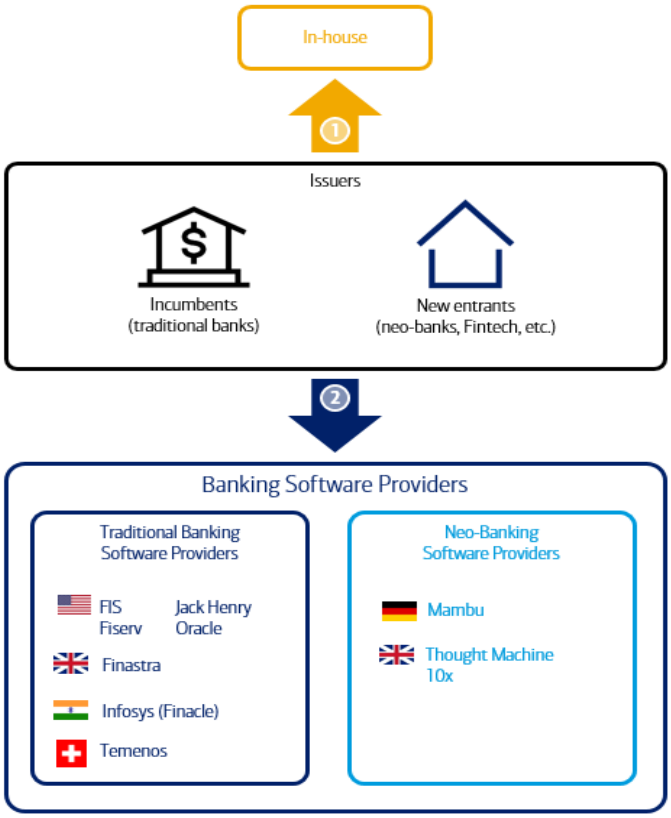
- **Security & confidentiality problem:** Tier 1 banks have access to a critical amount of personal data from their retail divisions and the complexity of their cores means that it is harder to keep track of the channels through which this data is communicated. As a result, Tier 1 banks are very cautious about keeping this confidential information in-house.

As a result, we believe Tier 1 banks will continue to tackle their CBS challenges in-house. However, we also see a trend of Tier 1 banks willing to reach out to next-generation cloud-based CBS providers, as is the case with JPMorgan Chase, which hired Thought Machine in September 2021 to migrate the core of its UK retail business. We do believe this trend of collaboration between large and small banks and innovative CBS provides scope for significant M&A whereby the large bank acquires the source code and capabilities of the CBS provider to develop and migrate CBS in-house.

The situation of Tier 2 and 3 banks is different, and we expect the disintermediation of banking services to provide them with incentives to specialise in core banking activities. As a result, we expect a moderate increase in banking software outsourcing (70%/30% internal/third-party spending in 2026 vs. 73%/27% split in 2021).

Finally, we believe the recent trend of neo-banks developing their own CBS in-house is not sustainable, especially as these providers attempt to retain the flexibility of their software architecture as a competitive advantage, whilst also trying to achieve scale to rival incumbents. As a result, we think a successful strategy for neo-banks is to outsource the maintenance and updating of their CBS to specialised third-party providers.

Exhibit 8: Banking software can be developed, updated and maintained in house or outsourced to specialised third-party banking software providers
Banks can choose between a multitude of software providers



Source: BofA Global Research

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Debate #3: incumbent vs. neo-vendors – who wins?

When outsourcing banking software capabilities, banks can choose between traditional enterprise vs. next-generation cloud-based banking software. Most current implementations are still traditional, although there has been a significant increase in recent years in banks of all sizes and types (incumbents and neo-banks) experimenting with next-gen systems. Their main limitation remains the breadth of their offering and their implementation capabilities.

In favour of incumbents:

- **Tried and tested:** Banks are risk-averse when it comes to core replacement. Given how embedded these core applications are, banks tend to prefer a tried-and-tested system to replace them. This naturally pushes them to rely on traditional banking software providers that have been around for 30+ years and whose solutions have been successfully adopted across markets. Nonetheless, we see an increasing number of banks turning to neo-banking software providers to develop innovative, cloud-based, API-first banking architectures.

- **Ready-to-use platform with broad module offering**: Traditional banking software providers have developed turnkey platforms that not only include CBS capabilities (ledger, account, computing, product) but also an integrated digital platform that provides all necessary features for the end-consumer experience (i.e., front-end capabilities, customer experience management, customer data processing and identity management). In addition, those solutions also tend to integrate other key modules such as Fraud & Compliance, Payments and Lending and Business Intelligence and Documents Processing. The end-product is thus fully functional

banking software that can be used across a vast number of different business lines, i.e., retail, corporate, wealth management, Islamic, etc. Comparatively, Mambu is the only neo-vendor to offer the same breadth of modules on its platform; however, it can only do so for retail and commercial banking solutions and is thus ill-adapted to the needs of many of the larger banks. Thought Machine and 10x have chosen to focus on pure next-generation, highly customised core capabilities and thus do not offer "out-of-the-box" solutions.

- **Some module excellence**: Some traditional CBS providers are also leaders in niche modules of banking software, which reinforces the attractiveness of their platforms. FIS and Fiserv, for example, are also world-leading merchant acquirers specialised in payment processing (see our Payments Primer for more detail). They also bring this excellence to the payments capabilities of their banking software, and their capabilities in this field are considerable. This acts as another competitive advantage for customer acquisition and retention. Finastra is also known for its lending software capabilities, which are well-above those of other banking software providers, both incumbent and new entrants.

- **Tailored to specific banks/geographies:** Not only do traditional core banking systems come with a broad range of functionalities, they are also made for heavy customisation to respond to the needs of a specific bank. Although this sometimes comes at the expense of agility and flexibility, it does respond to the needs of those banks that require such functionalities. This is the route chosen by FIS and Fiserv, which provide specific solutions tailored to and integrated with Tier 1 and 2 banks' existing systems in the US (although Fiserv also has an offering that is popular with SMEs (small & medium-sized enterprises). Similarly, Jack Henry's offering is targeted at Tier 3 banks and credit unions in the US. Finacle, the banking software venture by Indian firm Infosys, has developed an offering tailored to clients locally and across the Asia Pacific region. By tailoring their solutions to the precise needs of a specific set of banks and their exact challenges, those providers have secured significant market share and increased both the barriers to entry for neo-providers and the costs of switching for their customers.

In favour of neo-providers:

- **Next-generation technological architecture:** Next-generation core banking systems are designed to support a slightly more limited set of products and processes, but with a versatile toolkit (a software development kit, or a repository of APIs). They allow the integration of additional services demanded by consumers using an ecosystem of fintech or traditional partners. We believe this is the correct architectural answer to the problems of traditional CBS software, as it ensures loose coupling and fewer customisation problems down the line. The key competitive advantage of Neo-CBS providers resides in their advanced technological architectures that are far superior to those of traditional providers, regardless of their business strategy (providing a full banking software platform like Mambu or a highly customisable core-only like Thought Machine and 10x). While we expect migration from banks to those next-generation systems will take some time, we do believe that once the first bank successfully implements a large, "at-scale" next-gen core system, the floodgates of demand will open.

- **Cloud:** Neo-providers' software is cloud-native, i.e., it was designed for the cloud whereas the traditional provider's offering has been migrated to the cloud. This is more than a semantical difference: while the latter consists of the same offering on a different platform (the cloud), the former is actually architected from the ground up to run on, and take advantage of, cloud-based technologies, notably in terms of accessibility and scalability. Cloud migration is recent in the banking software sector: banks are just finding their feet in this arena and starting to come to grips with the security implications. It will take some time for them to start storing public

data on the cloud without fear. We see a lot of positive momentum in this area, with neo-banks leading the way. We also see sophisticated and constructive engagement by regulators as far as cloud hosting is concerned.

- **Agile culture:** There is a belief that traditional CBS-providers have developed a corporate culture similar to incumbent banks, characterised by a fixed mindset, resulting in complicated and lengthy decision-making and time-to-market strategies. Neo-providers, on the other hand, have developed an agile mindset that is not only reflected in their tech stack (i.e., micro-services operated separately and scaled efficiently) but also in their culture. Those companies operate in agile ways and understand the significance of showing value early via quick time-to-market projects. This has notably created a natural attraction from neo-banks and financial start-ups that operate under similar models.

- **Price:** Neo-CBS providers also tend to have more competitive pricing than incumbents. Customers from Mambu and Thought Machine have highlighted the compelling prices of their offerings vs. those from FIS, Fiserv, and other traditional providers. This also makes it a viable solution for early stage neo-banks and start-ups that cannot afford the highly tailored products of FIS and Fiserv. Despite the critical nature of CBS, we think banks will increasingly consider pricing dynamics, not least because those projects are costly and tend to overrun, but also because of industry trends whereby cash usage and investment is critical to remain competitive.

Banking software architecture components

Core Banking Software (CBS) is a back-office system that processes daily transactions and posts updates to accounts and other financial records. These systems typically include deposit, loan, and credit processing capabilities with interfaces to general ledger systems and reporting tools. In the context of Open Banking characterised by the proliferation of APIs as well as consumers' digital banking behaviour, CBSs are typically integrated with other modules offering additional capabilities (Lending, Payments, Fraud & Compliance, Business Intelligence, etc.), as well as communication channels (Digital Banking Platform, Interactive Voice Response, etc.). Different CBS suppliers offer varying capabilities, from a highly specialised and tailored core system to a full turnkey banking software platform to power a modern bank.

Exhibit 9: Banking Software Architecture: a visual representation
Core Banking System (CBS) complemented with capabilities (payments, lending, business intelligence, channels, fraud & compliance, etc.) and distributed through different channels, increasingly digital via Digital Banking Platforms

Digital Banking Platform		Other Channels
Front-end presentation & interaction	Customer experience management	Remote advisors & contact centres
Cloud deployment	API Connectivity	Interactive voice response (IVR)
Customer data processing	Identity & entitlement management	ATMs
Fraud & Compliance		
ID verification	Biometrics authentication	Predictive analytics for fraud prevention
Deposit fraud	Card fraud	Positive pay
Online fraud mitigation	Enterprise fraud management	Anti-money laundering
Financial risk modelling	Market risk	Credit risk
Liquidity risk	Operational risk	Fraud/AML
Payments	**Lending**	**Business Intelligence, Document Processing**
Credit card processing	Consumer loan origination	Account analysis
Debit card processing	Small-business loan origination	Document imaging
Prepaid card processing	Commercial loan origination	Check imaging
ATM driving and processing	Consumer mortgage processing	Item processing
ETF switching	Consumer loan servicing / collection	Remote deposit capture
Loyalty and reward programmes	Commercial loan portfolio management	Mobile capture
Merchant acquiring and processing	Loan modification	Branch capture
Bill payment		Integrated receivables
P2P payment		Predictive analytics for cross-sell
Payment hub		CRM
Real time payment solution		CEO/Board Dashboard
International payment		
Core Banking System (CBS)		
General Ledger	Trade clearing	Reconciliation
Matching & Confirmation	Treasury operations	Account analysis & billing
Customer information	Limits & Collaterals	Reporting
Card issuance & servicing	Liability/deposit servicing	Management Information System
Loan origination & servicing	Underwriting	

Source: BofA Global Research estimates
Note: scheme is simplified for illustrative purposes. List of main systems are modules is non-exhaustive and can differ depending on provider and end-user bank

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Core Banking Software (CBS)

A CBS system is defined as a back-end infrastructure that processes banking transactions across a bank's various branches. The system essentially includes deposit, loan and credit processing. Among the integral core banking services are floating newts, servicing loans, calculating interests, processing deposits and withdrawals, and customer relationship management activities. A core banking system has four key capabilities:

- **Ledger:** The ledger is the heart of the core. It is the immutable list of the transactions processed by the core, often regarded as the source of truth for movement of funds in the bank.
- **Accounts:** The accounts are a record that can be mapped to a customer account or a bank account or a special accounting record such as a clearing account. Each transaction in the ledger references both a debit and credit account
- **Computing balances:** Depending on the complexity of the core, this can range from a simple balance for each account to a move involved structure that tracks multiple dimensions within each account, such as assets, currency and ring-fenced funds.
- **Product engine:** The scope of the product engine differs from core to core and can involve anything from interest calculations to sweeping funds across accounts to meet complex processing rules.

As the technology powering the core develops, new generation CBS systems are being designed that are: (1) cloud-native; (2) comply with modern financial regulation by design; and (iii) respond to digitally native customers' expectations (i.e., instant payments). In Europe, Mambu, Thought Machine and 10x are emerging as providers of modern CBS.

Channel solutions

A core banking system by itself is not sufficient to operate a modern bank, given it cannot provide the capabilities required to interact with end customers: channel solutions are required. With the rise of open banking, the convergence of mobile and online banking and the resulting increased user experience expectation from customers, channel solutions have become critical for banks to gain and retain competitive advantage.

However, channel solutions also include the more "traditional" channels, such as call centres and remote advisors, ATMs and Interactive Voice Response. For incumbent banks, a key challenge involves integrating traditional capabilities with digital platforms to provide seamless experiences, i.e., by sharing customer details, history, communication preferences and customer analysis in between the different channels.

Increasingly, a critical aspect of channel solutions involves gathering and leveraging data to gain additional insights into customer behaviours and preferences to enable a superior customer experience such as customised alerts and notifications (i.e., send fraud alerts, bank activity, marketing messages and payment information on the customer's preferred channel).

Digital Banking Platform (DBP)

The Digital Banking Platform provides an integral foundation that connects the CBS with SaaS software as well as fintech infrastructure and services via APIs with the aim of providing the best end-to-end customer omnichannel experience. Most specifically, digital banking platforms consist of:

- **A presentation layer** that enables customers to conduct their business;

- **An experience management layer** that facilitates designing a coherent experience across all customer touchpoints;
- **A client and orchestration layer** that processes customer data and orchestrates between the presentation layer, legacy back-end software, SaaS solutions and connected fintech ecosystems;
- **A product layer** in which ideally no customer data is stored or processed;
- **An identity & entitlements layer** that supports the management of user rights and provides defence against security breaches;
- **A cloud deployment layer** to scale up (and down) native-cloud technology at scale to support business operations.

Other services

Payment solutions deliver frictionless payments and protect against fraud

Payment solutions supply the underlying technology to process payments via a multitude of channels, i.e., from ACH (Automated Clearing House) to debit, credit and prepaid cards. These solutions are integrated to the banking software system to deliver a frictionless, easy payments experience to customers while also protecting the bank against risk and fraud losses.

When acting as a centralised hub, the solution standardises, accelerates, automates and integrates payment flows across geographies and entities, efficiently linking multiple payment sources and channels with numerous clearing and distribution networks and services.

Lending solutions: range of capabilities allowing lending services for different customers

Lending solutions are back-end software capabilities for banks to be able to cover the entire lending lifecycle (i.e., origination, processing, servicing, modification and collection). Lending software solutions typically include a wide range of capabilities allowing banks to provide lending services for different customers (i.e., consumer and mortgages, small-business, commercial, etc.).

Among external banking software providers, Finastra has developed a strong specialisation in the lending software space, especially for commercial banking. This strength is coupled with its platform, which allows banks to handle all types of loans from within the single platform. Most recent Fusion Phoenix (Finastra's CBS) wins have reportedly been for banks and credit unions requiring strong lending, commercial functionality and modern, open core banking platform capabilities.

Fraud & compliance solutions – to detect and prevent fraud

Banking fraud and compliance software are designed to assist financial institutions. Software capabilities typically combine features of KYC (Know Your Customer), AML (Anti-Money Laundering), and authentication. Capabilities also include financial, credit, liquidity and market risk modelling.

We expect increased focus on this set of software capabilities from both incumbents and neo-banks as the move to digital banking results in additional cyber-risk for financial institutions and their customers. We believe neo-banks are somewhat ahead of traditional banks in leveraging modern technology to detect and prevent fraud. Given these banks are digital by nature and their business model rests on allowing customers to perform banking operations completely remotely, they have already integrated significant capabilities (i.e., facial recognition analysis software for account opening) into their software back-end architecture.

We believe there is a broad scope of application for innovative technology solutions in fraud and compliance banking software. Specifically, we believe pattern recognition analysis and Machine Learning have the potential to provide innovative solutions to identify potential fraud and notify both the bank and the customer as well as eventually anticipate and prevent fraud.

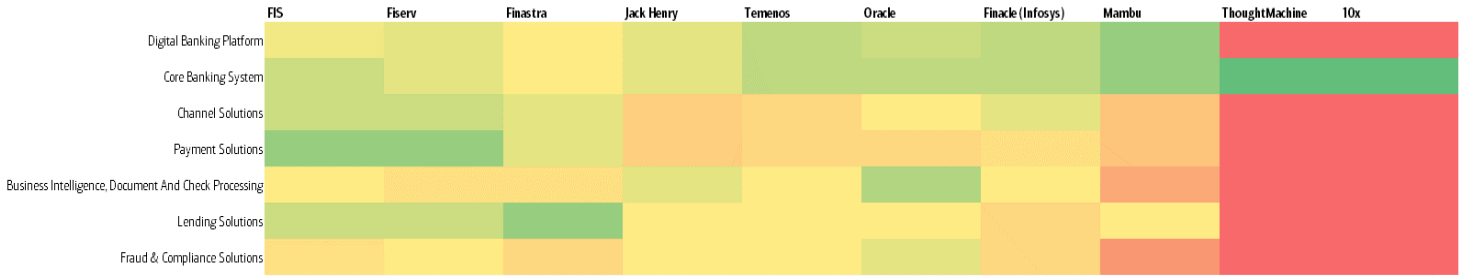
Business intelligence, document and check processing

Business intelligence, document and check processing software is associated with "traditional" back-office capabilities that are not specific to banks. These capabilities are used to gather, analyse and present data from business operations to different stakeholders so that they can make informed decisions. This notably includes features such as account and spending analysis for consumers; fraud and compliance insights for relevant departments; regulatory reporting; and financial performance for managers and C-suite, etc. Some features are nonetheless specific to the banking sector, i.e., remote deposits, mobile and branch capture, as well as integrated receivables.

Banking software providers: comparison of products offering breadth

Different banking software suppliers offer varying capabilities, from a highly specialised and tailored core system to a full turnkey banking software platform allowing a modern bank to operate.

Exhibit 10: Comparison of product offering breadth and strength amongst banking software providers
New players focus on providing best-in-class, specialised CBS whilst incumbents offer comprehensive, turnkey solutions



Source: BofA Global Research estimates, company data

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Traditional leading banking software providers have secured top positions in the market by offering a platform that encompasses all the services banks may need to integrate into their systems to operate. The strength of their offering stems from its comprehensiveness rather than individual solutions. Nonetheless, some of these providers have succeeded in developing excellence in some products, which enhances customer acquisition and retention. Among those, FIS and Fiserv, which are also world-leading merchant acquirers, have used their strengths in the payments sector to develop leading payments back-end software for financial institutions. Similarly, Finastra has developed a market-leading, comprehensive set of lending solutions across sectors (retail, commercial & business, investment and insurance), which is one of the main reasons why some customers use their banking software suite.

At the other end of the spectrum, Thought Machine and 10x only provide CBS technology in-house. Their CBS are highly innovative, cloud-native and next-generation. They are also highly flexible and can be configured to run any type of bank product. As a result, banks that use those solutions typically enjoy a custom-made core engine, which is perfectly tailored to the structure of their business and their needs. These modern core engines are built around APIs using micro-service architecture, ensuring seamless connectivity with external applications. As a result, all other software solutions (i.e., payments, lending, etc.) are integrated to the core via APIs. This notably allows banks to

select best-in-class solutions from fintech companies without committing to using a single platform from just one provider.

In the middle of the spectrum, we identify providers with solid CBS systems (though not as advanced as neo-providers) and intermediate breadth of offering (though not as wide as traditional leading providers). For example, Finacle CBS needs to be complemented by externally sourced credit rating, scoring and review functionality to enable operation in the lending domain. Similarly, Temenos' DGP (Infinity) and CBS (Transact) are individually more advanced than those of other traditional providers and very well integrated as a unified platform. However, Temenos offers fewer peripheral solutions than FIS and Fiserv, and those that it does offer (i.e., payments) are not as advanced.

Sector solutions

Banking software providers typically provide solutions across six sectors:

- **Retail banking:** Mainstream consumer banking segment for individuals and small businesses. Typical products offered are portfolio management and investment services, as well as financial planning and advice.
- **Commercial & Business Banking:** Services for larger, domestic and multinational commercial clients and include payments, cash management, trade services, liquidity management, etc.
- **Wealth Management:** Private banking and wealth management services for high net worth clients. Typical products include portfolio management and investment services, and financial planning and advice.
- **Investment Banking:** Services for corporations, other financial institutions and governments, including raising funds via capital markets, trading and investment services.
- **Insurance:** Services for life and annuity insurance (life insurance, accident, health and annuities) and non-life insurance (property and casualty products).
- **Islamic Banking:** Services that are Shari'ah compliant for the Islamic banking community.

Banking software providers: comparison of business line offering breadth

Traditional market-leading banking software providers FIS and Fiserv offer capabilities across all main business lines, in line with their strategy of market domination across segments and business lines. Temenos also offers capabilities across business lines, while Finastra and Jack Henry, which are focused on Tier 2 and 3 banks, respectively, have no incentive to develop Wealth Management capabilities. Similarly, Oracle and Finacle's clients tend to be smaller banks who do not require Investment Banking capabilities. On the other hand, neo-providers have all started with developing retail capabilities, although Mambu has since extended its offering to include Commercial & Business Banking. Thought Machine has also disclosed its intention to expand into Commercial Banking and Private Wealth shortly.

Exhibit 11: Comparison of business line offering breadth amongst banking software providers

New entrants focus on providing best-in-class, specialised banking software whilst incumbents offer solutions across business lines

	FIS	Fiserv	Finastra	Jack Henry	Temenos	Oracle	Finacle (Infosys)	Mambu	Thought Machine	10x
Retail	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Commercial & Business	✓	✓	✓	✓	✓	✓	✓	✓	X	X
Wealth Management	✓	✓	X	X	✓	X	✓	X	X	X
Investment Banking	✓	✓	✓	✓	✓	X	X	X	X	X
Insurance	✓	✓	✓	✓	✓	✓	✓	X	X	X

Source: BofA Global Research estimates

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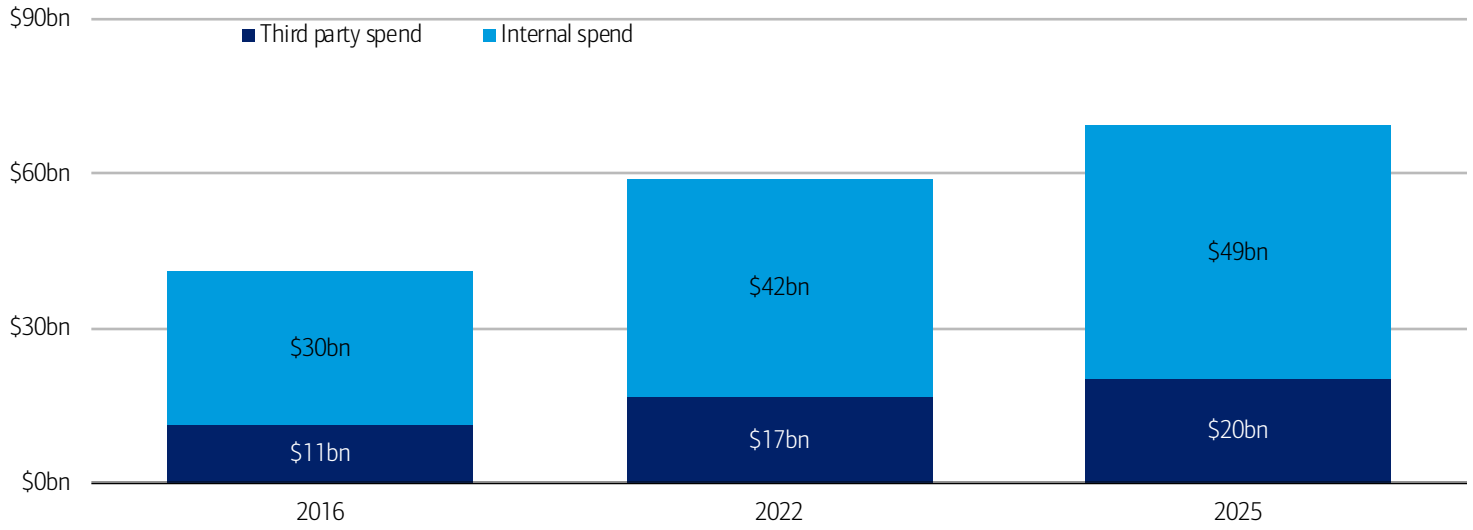
Banking software market dynamics

Total addressable market

Exhibit 12: Global Banking Software Total Addressable Market (TAM) 2016-2025E
TAM grew from $41bn in 2016 to $56bn in 2021 and is expected to reach c. $69bn in 2025.



Source: BofA Global Research estimates

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We estimate the Global Banking Software market generated nearly $59bn in 2022, up from $41bn in 2016. During this period, the market grew at a 6.3% CAGR, carried by a 6.6% CAGR for third-party spending vs. a 6.1% CAGR for internal spending from banks and financial institutions. Going forward, we expect the Total Addressable Market to continue to expand, growing at a 5.5% CAGR to 2026. We believe third-party spending will continue to outgrow internal spending, with 7.0% and 4.9% CAGRs, respectively, over the 2022-2025 period.

Exhibit 13: Global Banking Software CAGRs in past 6y and next 3y
TAM grew by 6.1% in past 6y, with third-party spending growing faster than internal spending (6.6% vs 6.1% internal spending) ; trend is expected to continue, with TAM growing 5.5% until 2025 (third-party spending CAGR 7.0%, internal spending CAGR 4.9%)

CAGR	2016-2022	2022-2025
Internal Spend	6.1%	4.9%
Third Party Spend	6.6%	7.0%
Total Addressable Market	6.3%	5.5%

Source: BofA Global Research estimates

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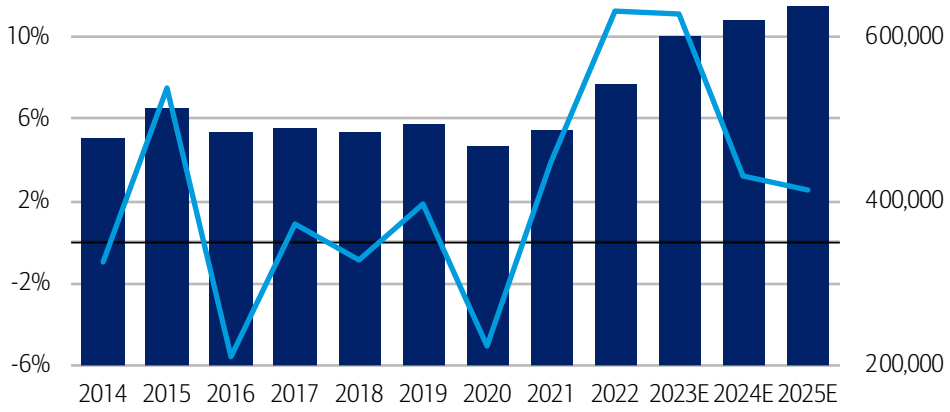
We believe one main driver of this growth in the global banking software market is the growth of banks' revenues. Indeed, the macroeconomic environment is increasingly favourable to banks, with normalised interest rates supporting growth estimates until at least 2025. We expect this to result in additional firepower for banks to invest in technological capabilities and undertake large-scale migration projects.

The BofA Global Research European banks team sees revenue growth set to slow to 3% in 2024/2025, after >10% growth in 2022/2023 with restoration of normal earnings. This forecast assumes rate cuts in late 24E but in a lower-rate 2024, banks have replicating portfolios, fees and volumes that will support revenues. In contrast to early 2023 banks should experience little stress alongside the consumer with the residential property market already stabilising, which should encourage lending growth into the recovery.

Exhibit 14: European banks: a revenue slowdown after rapid normalisation
Revenue growth % y/y (€) and absolute level, right side, € mn. 2014-25E



Source: BofA Global Research estimates, company report

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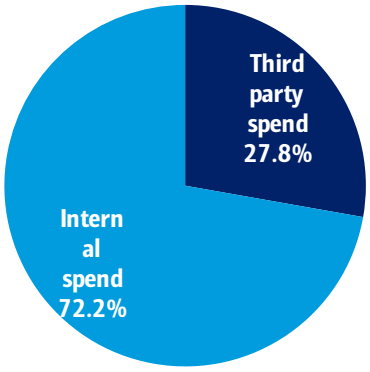
We believe internal spending will continue to make up the majority of the Banking Software market. We also believe the trend of outsourcing Banking Software responsibilities will further intensify, as both incumbents and new entrants in the financial industry increasingly call on specialised service providers to take care of their back-end systems in an increasingly crowded and competitive environment. We nonetheless expect this shift to remain progressive due to the constraints of the industry (size of T1 banks and existing back-end systems, slow decision processes, existing IT workforce reluctant to outsourcing. regulations, etc.). As a result, we expect third-party spending to grow from 27.8% of total spending in 2016 to 29.3% in 2025.

Exhibit 15: Third-party spending vs. Internal spending - 2016
27.8% Third-party spending vs. 72.2% Internal spending



Source: BofA Global Research estimates

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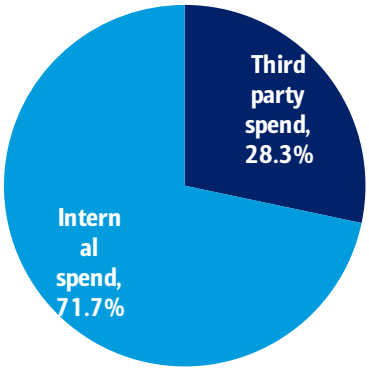
Exhibit 16: Third-party spending vs. Internal spending - 2022
28.3% Third-party spending vs. 71.7% Internal spending



Source: BofA Global Research estimates

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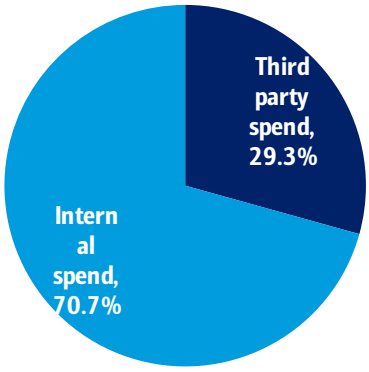
Exhibit 17: Third-party spending vs. Internal spending - 2025
29.3% Third-party spending vs. 70.7% Internal spending



Source: BofA Global Research estimates

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Banking software providers: competition and strategies

Current dynamics: multitude of CBS providers with a wide range of strategies

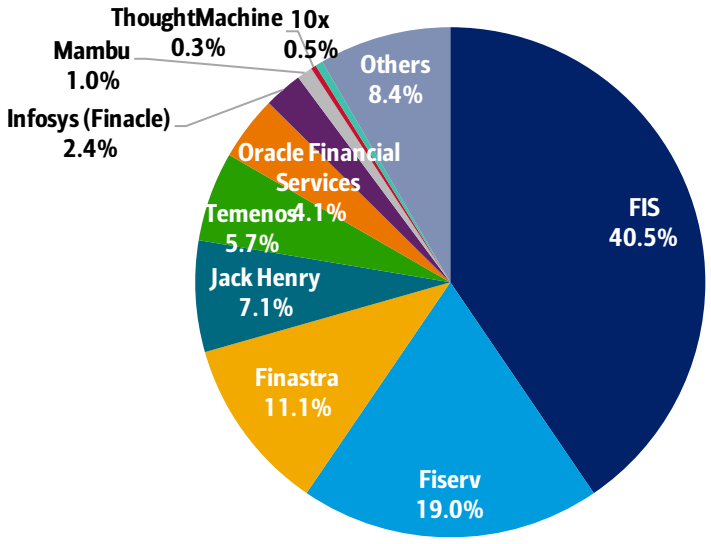
The banking software market is fragmented, with three types of providers:

1. **Incumbent market leaders with comprehensive banking offering (FIS, Fiserv):** FIS and Fiserv are traditional US companies that have been providing a comprehensive range of services in the Banking industry for more than 35 years. FIS offers capabilities in Banking, Payments and Capital Markets while Fiserv offers capabilities in Merchant solutions, Integrated Banking, Digital Payments and Card Payments. With total revenues from banking software in excess of c$10bn, these companies dwarf the rest of the competition, and the breadth of their offerings goes well beyond CBS to include all banking software systems relevant to financial institutions – i.e., they also have a broad range of capabilities including merchant services as well as capital markets and other corporate solutions. As a result, those companies share c. 60% of the Banking software market (c. 40% and 19% market share for FIS and Fiserv, respectively, in 2022).

2. **CBS-focused incumbents (Finastra, Jack Henry, Temenos, Oracle, Infosys):** Unlike FIS and Fiserv, those companies' offering is focused on providing banking software platforms to financial institutions. These companies differentiate themselves by specialising on a specific segment, sector, geography or technology. This is reflected in their market share going from 2% for Infosys to 11% for Finastra, with Oracle (4%), Temenos (6%) and Jack Henry (7%) in between.

3. **Specialised new entrants (Mambu, Thought Machine, 10x, etc.):** Although new entrants have differing strategies (i.e., Mambu offering full banking software platform vs. Thought Machine & 10x specialising uniquely on the CBS segment), they all rely on a technology stack that is significantly more modern than the other banking software providers, which is a key differentiator in the market. Those companies have only recently entered the market and currently account for <2% the market together in 2022 – though they exhibit high growth and we expect this share to grow in the future.

Exhibit 18: Estimated market share of Global Banking Software providers in 2022
US giants FIS and Fiserv dominate market with 40% and 19% market share respectively, neo providers share <2% market share

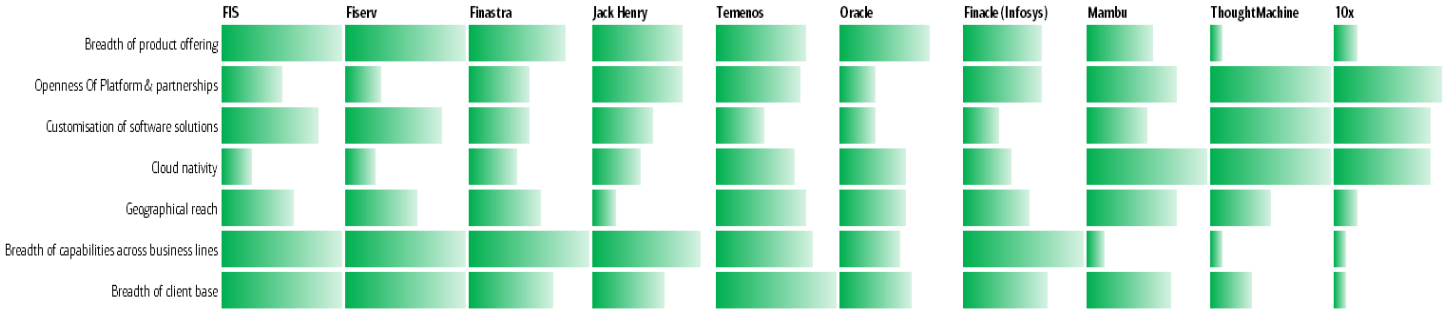


Source: BofA Global Research estimates, company data

BofA GLOBAL RESEARCH

Exhibit 19: Comparison of capabilities amongst banking software providers

New specialised players build strength from robust cloud-native, highly customisable software whilst incumbents rely on breadth of product offering suitable to institutions in many verticals (i.e., credit unions, capital markets, etc.)



Source: BofA Global Research estimates, company data

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Market share evolution to 2025

We believe the needs of banks (both incumbent and digital new entrants) are well-served by the plethora of aforementioned third-party providers. As a result, we expect the market share distribution to remain relatively stable over the comings years. In addition, the critical nature of software infrastructure for banks and the high switching costs further reinforce this stability, in our view. As a result, we believe market share gains/losses will be contained to c. +/-1pp. Overall, we see three trends for the 2022-2025 periods:

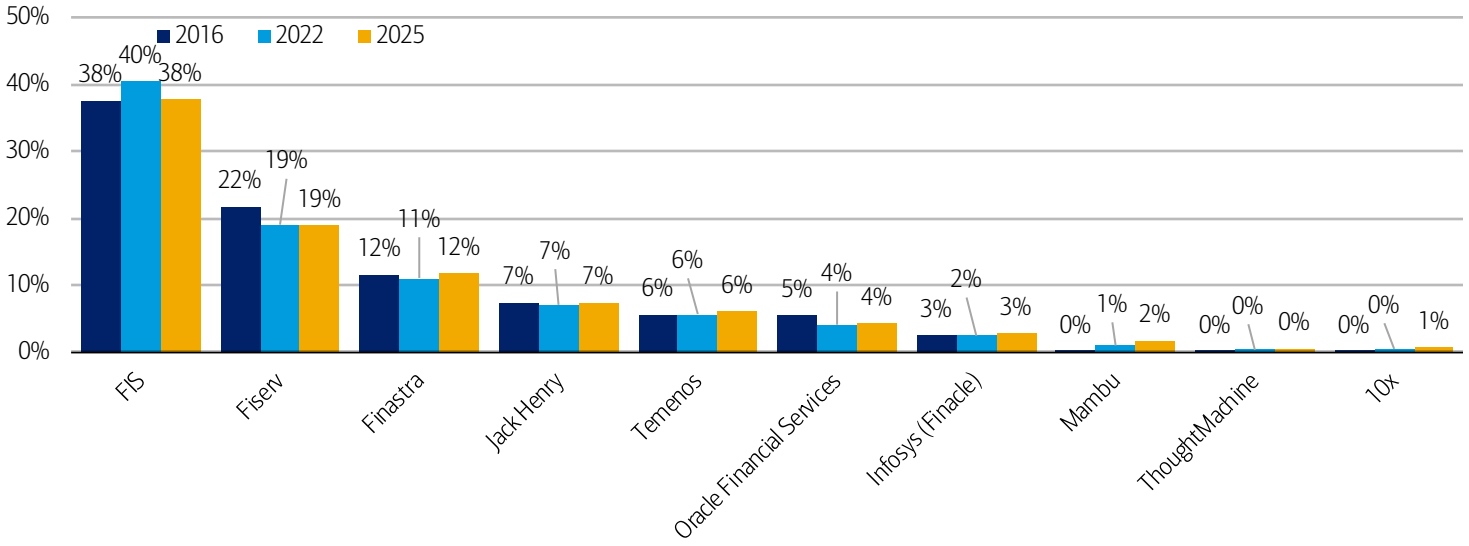
1. FIS & Fiserv to remain market leaders despite losing small market share at the margin;

2. New entrants (Thought Machine, Mambu, 10x) gaining market share but remaining small overall;

3. Middle market consolidating.

Exhibit 20: Market share evolution of banking software third-party providers

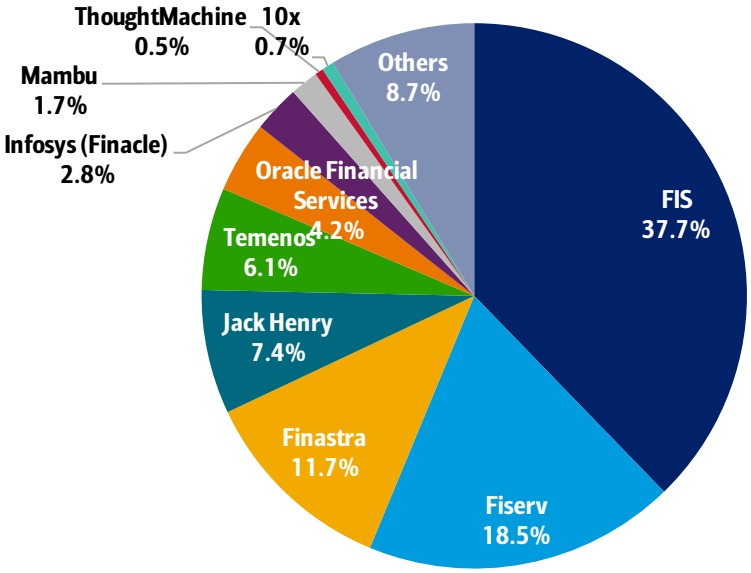
Market share distribution to remain stable overall, with some losses from actors focusing on other segments (i.e., Fiserv & payments, Oracle & ERP, other minor players), benefitting mostly new entrants



Source: BofA Global Research estimates

BofA GLOBAL RESEARCH

Exhibit 21: Estimated market share of Global Banking Software providers in 2025
Stable market share distribution with movements contained within +/- 1 percentage point bar FIS



Source: BofA Global Research estimates

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1. FIS & Fiserv remain leaders despite losing small market share at the margin

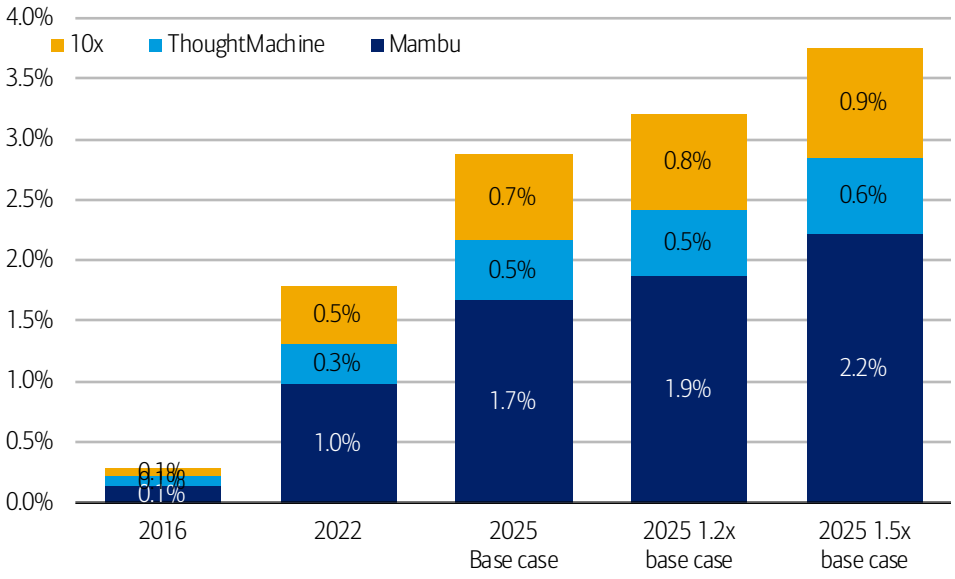
We see FIS and Fiserv remain the dominant third-party banking software providers thanks to their comprehensive range of services paired with the long experience and solid existing client base. We also believe their expertise as leading merchant acquirers reinforces the appeal of their offering.

We expect minimal market share evolution for those two providers: our US analysts forecast Fiserv's banking software (included within "Financial Solutions") to grow at a 6.4% CAGR for the 2022-2025 period while FIS' banking software solutions ("Banking Solutions") segment should grow at 2.5% CAGR over the same period, resulting in a market loss of -2.7pp for FIS.

2. New entrants gaining market share but remaining small overall

We believe neo banking software providers Mambu, Thought Machine and 10x will outgrow the market during the period 2022-2025 as both traditional financial institutions and neo-banks select their services to launch new products on modern core systems (even if simply to try out the latest technology stack they offer), leading to very small market share gains. Our base case assumes a CAGR of 25% for Mambu and Thought Machine, and of 20% for 10x – which is conservative vs. their latest reported growth. We estimate these three providers will make up just below 3% of the global banking software market by 2025.

Exhibit 22: Neo providers 2022-25 market share gains – sensitivity analysis
BofA base case assumes neo providers to share 2.9% of total market in 2025; higher growth of 1.2x / 1.5x base case would result in total market share of 3.2% and 3.8% respectively



Source: BofA Global Research estimates

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We believe that the rate of adoption of those products and services could differ significantly depending on those providers' ability to provide a successful proof of concept at scale, i.e., a high profile success with an established Tier 1 bank like the Thought Machine / JPM deal, which is currently underway. We believe this would act as a trigger for other established financial institutions to seek neo-providers' services. Therefore, we also provide a sensitivity analysis which assume 1.2x and 1.5x base case growth rates. This would result in 3.2% and 3.8% market share between those three actors in 2025.

3. Middle market consolidating

We believe the rest of the market will remain relatively stable, with only some marginal market share evolution. We see two companies gaining market share:

1. We expect Temenos to outgrow the market given its renewed focus on the US market as well as its successes with neo-banks, resulting in a small gain of +0.4pp market share.

2. We expect Infosys (Finacle) to gain +0.4pp market share, driven by a successful strategy of expertise in catering specifically for financial institutions in developing countries in Asia Pacific and Africa, which are undergoing rapid digitisation in all sectors, including banking.

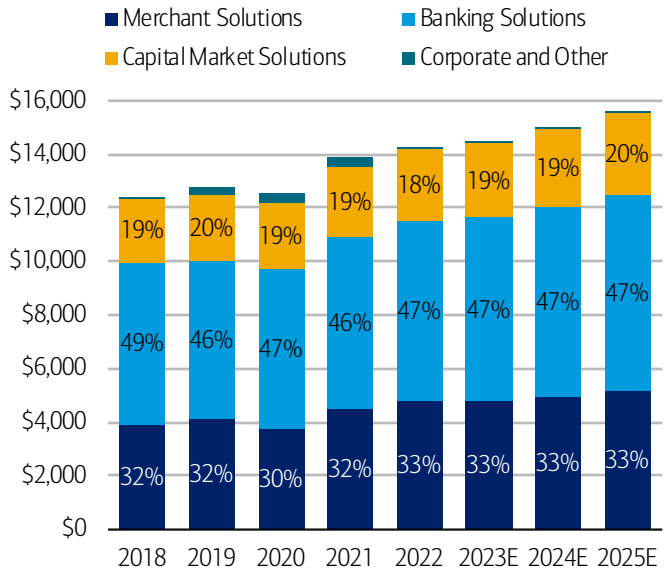
Banking Software Providers' Profiles

FIS – caters to financial institutions; banking revenues of $7bn

FIS (covered by BofA Global Research analyst Jason Kupferberg) is an American company that offers a wide range of financial products and services worldwide. FIS was founded in 1968 as Systematics and now employs c.62,000 people. It serves more than 20,000 clients in more than 130 countries and ranks in the Fortune 500 and S&P 500.

The company offers its core banking solutions in three primary segments: merchant solutions, banking solutions, and capital market solutions. With revenues just under $7bn for banking solutions, FIS is one of the largest companies to offer banking software services to financial institutions, along with its counterpart Fiserv.

Exhibit 23: FIS revenue evolution and split by business line
Banking solutions is FIS' biggest business line and is expected to make up 47% of total revenues in 2022



Source: BofA Global Research estimates, company data

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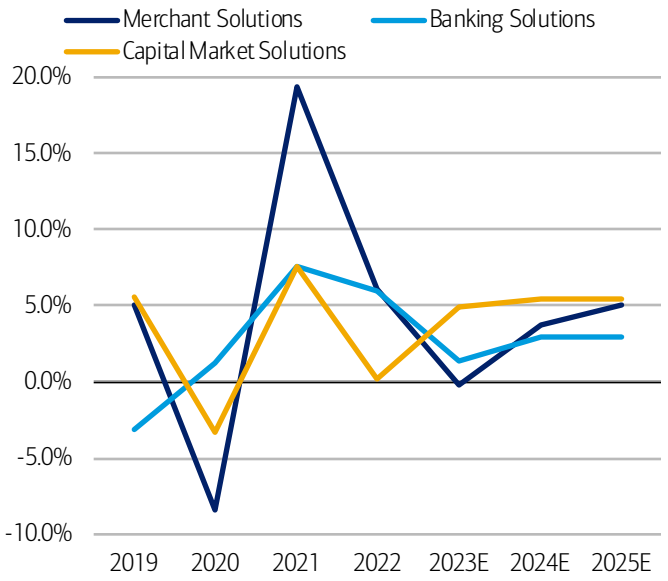
Exhibit 24: FIS business lines historical and forecasted growth rate
Banking solutions expected to increase at 2.5% CAGR in 2022-25



Source: BofA Global Research estimates, company data

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Banking solutions have accounted for almost half of total revenues in recent years, and we expect this to remain broadly the case for the foreseeable future. We forecast a 2.5% CAGR for this segment in 2022-2025, slightly below the broader third-party banking software market. As a result, we expect FIS' 40% share of the core banking software market to erode slightly during this period.

Banking products – comprehensive and high-quality offering

FIS has one of the most comprehensive and high-quality offerings in terms of banking software systems. The list of products includes banking hardware, core banking, card issuing and processing, digital payments, commercial lending, fraud, risk and compliance and other banking and payments-related services. FIS offers 13 core systems in total, with IBS, Horizon, Profile and Systematics accounting for almost half of its total core clients.

- **IBS:** Targeted at institutions with $1-30bn of assets, IBS is a comprehensive highly integrated and flexible retail and commercial banking platform that meets financial institutions' go-to-market needs. It is a fully outsourced solution available in FIS' service-bureau environment.

- **Horizon:** Leading core solution in the community banking market. It provides a broad set of functionalities for community banks. Its customers benefit from powerful commercial lending, substantial mortgage capabilities and private banking. Horizon is offered in an in-house, service-bureau or facilities management environment, although more than 75% of customers have it deployed in a service-bureau environment.

- **Profile:** A real-time retail and commercial banking application favoured by large, international financial institutions; it can be deployed in both a licensed and application service provider (ASP)/hosted environment

- **Systematics**: Offered to large financial institutions, Systematics is a multilingual, multicurrency platform available in both a licensed and ASP/hosted deployment environment, with most clients opting for an on-premise deployment

In the context of system modernisation and solution agility, FIS has deployed **FIS Digital One**, a platform of integrated banking modules that delivers an omnichannel banking experience for financial institutions and their customers. Digital One offers a seamless user experience and real-time access to customer, account, and transactional data across all banking channels. It leverages an open, API-based framework and a common code base, thereby reducing technical investments, while adding capabilities. The platform allows financial institutions to modernise their user experience in phases or altogether with a full deployment. These advantages align with bank strategies, allowing for a truly unified banking experience.

Competitive advantage, differentiation strategy, market share evolution

FIS has successfully managed to establish itself as a provider of all banking solutions for all financial institutions. Its 13 core banking systems provide for financial institutions of all sizes and across all segments (retail, commercial, wealth management, etc.) with turnkey as well as highly tailored solutions. As a result, FIS clients tend to choose the vendor for its broad product portfolio as well as the ability to have a single partner able to meet the majority of their technology needs.

Specifically, FIS has a solid record of combining core banking solutions ATM switch, debit card management system and digital banking platform in a practically, pre-integrated solution, thereby reducing the risk and integration time for the financial institution. For Tier 1 banks, FIS provides highly tailored solutions designed to integrate seamlessly within the banks' legacy systems and to answer their specific needs. This makes FIS solutions highly path-dependent and increases the cost of switching for its customers.

Additionally, the company boasts good integration with its other payment solutions – which represented 33% of total revenues in 2021. As a result, the payments banking software solutions it offers are unmatched by other banking software providers, notably in terms of acquiring and processing capabilities. This is another attractive selling point for customer acquisition and retention.

Modern Banking Platform (MBP)

In 2020, FIS launched its Modern Banking Platform (MBP), which represents a significant evolution of FIS' core banking solution. Since its introduction, FIS' MBP has rapidly expanded its available functions. The FIS Modern Banking Platform is a fully componentised, container-deployed processing solution that provides for a complete solution that is highly agile and extensible:

- As the account and transaction engine, the system houses and controls the quality of the data, the validity of transactional and balance accuracy, and the depth and breadth of services that can be offered to customers.

- As a product factory, the system provides the ability to respond quickly and effectively to evolving and dynamic customer and market demands.

- As an information repository, the system defines the quality and accuracy of management reporting.

Developed as a fully componentised solution, the FIS MBP provides a multitude of configurable features, at the enterprise level. The 100% Java-based solution is purpose-built for banking, designed to meet the unique business and product needs of individual retail and commercial financial organisation across all lines of business. The FIS MBP core banking solution offers industry-leading total cost-of-ownership benefits, based on lower infrastructure and ongoing operating costs, as well as increased productivity. Its proven scalability and high availability make it a prominent choice for organisations committed to implementing a 24/7, always-on solution.

Overall, this platform has helped the company accelerate revenue growth to levels higher than before the COVID-19 pandemic.

Exhibit 25: FIS main disclosed clients with specific product usage
FIS is a popular provider for Tier 1 banks, in core banking as well as account reconciliation, digital capabilities and portfolio and investment management capabilities

Customer	Vendor	Product
Alpha Centauri	FIS Global	FIS Investment Risk Manager
Amlin Corporate Member, Ltd.	FIS Global	FIS Treasury and Risk Manager
Bank Leumi USA	FIS Global	FIS IBS Core Banking Platform, Digital Banking Platform
Cadence Bank	FIS Global	Hosted Core Banking Solutions
Centaur Fund Services	FIS Global	FIS Investment Accounting Manager
Centennial Bank	FIS Global	FIS Bank Compliance Solutions
Citizens Financial Group, Inc.	FIS Global	FIS Profile Core Banking, Call Centre Mgt, AML, Fraud Protection, Online Banking
Commercial Bank of California	FIS Global	FIS Horizon Core Banking; Smartsign
Credit Agricole Egypt	FIS Global	FIS Data Integrity Manager (Account Reconciliation)
Credit Suisse	FIS Global	FIS Derivatives BPaaS (Post-trade Derivatives Clearing Operations)
Deutsche Asset & Wealth Management	FIS Global	FIS Private Capital Suite
Fidelity Bank	FIS Global	FIS Global Horizon Core Banking
Fifth Third Bank	FIS Global	FIS Unity Wealth Platform, FIS Modern Core Banking Platform
Heritage Bank	FIS Global	FIS Horizon Core Banking Migration
ICBCFS	FIS Global	FIS Corporate Actions Manager
Landmark Bank	FIS Global	FIS Digital One Digital Banking
LBBW	FIS Global	FIS Trading & Connectivity
Maples Fund Services	FIS Global	FIS Private Capital Suite
Morgan Stanley	FIS Global	FIS Sungard InvesTier (Portfolio & Investment Management Services)
National Capital Bank	FIS Global	FIS Horizon Core Banking
NBH Bank	FIS Global	IFS IBS PREBOTs (Robotic Process Automation of Lending)
Newbury Bank	FIS Global	FIS Horizon Core Banking (Core Migration)
PriorityOne Bank	FIS Global	FIS Horizon Core Banking
Schroder & Co Bank AG	FIS Global	FIS Data Integrity Manager (Account Reconciliation)
State Bank of India, California	FIS Global	FIS Core Banking
The Goldman Sachs Group, Inc.	FIS Global	FIS Private Capital Suite
Thrivent Financial for Lutherans	FIS Global	SunGard Asset Arena
Wintrust Bank	FIS Global	FIS Code Connect (API Connectivity)

Source: Company press releases & website

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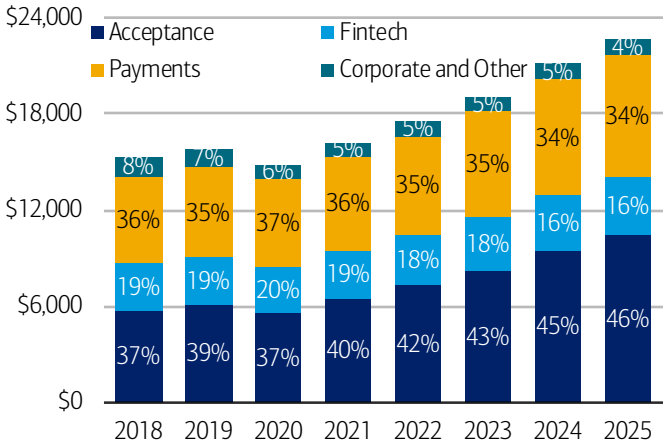
Fiserv – 1 in 3 US financial institutions relies on its core banking platform

Fiserv ((covered by BofA Global Research analyst Jason Kupferberg) is a US fintech company that offers the full breadth of products in areas such as payments, core processing, risk and compliance, customer and channel management, commercial services, as well as insights and optimisation. The company is a member of the Fortune 500, and approximately one in three financial institutions in the US relies on one of its core banking platforms, thereby providing it with an organic audience for its other offerings.

Fiserv has four business lines, with the majority of its banking software offering included in the Fintech segment, which represented c.19% of total revenues in 2022 (equivalent to c.$3bn).

Exhibit 26: Fiserv revenue evolution and split by business line
Acceptance and Payments segments account for 42% and 35% of total revenues respectively in 2022; Fintech and Corporate account for 18% and 5%.



Source: BofA Global Research estimates, company data

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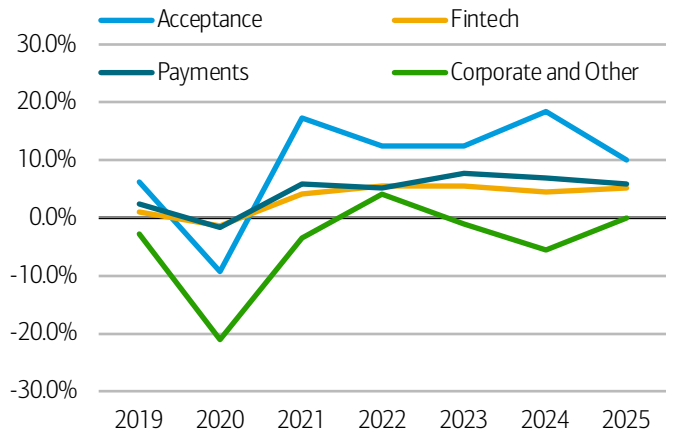
Exhibit 27: Fiserv business lines historical and forecasted growth rate
Acceptance and Payments segments have highest medium-term growth prospects vs. Fintech and Corporate



Source: BofA Global Research estimates, company data

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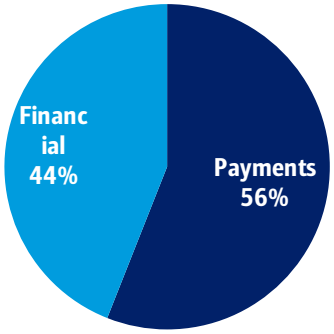
Shift towards fast-growing payments sector

In January 2019, Fiserv acquired merchant acquirer First Data. This not only increased its exposure to payments, the fastest-growing segment in the banking software industry, but also allowed it to achieve revenue and cost synergies, maximise cross-selling opportunities, and gain access to new markets and customers: Fiserv provided the expertise in processing credit and debit transactions while First Data provided the merchant services as well as POS (point-of-sales) technology, resulting in a company capable of offering an end-to-end payment platform from issuance to acceptance – with the second-biggest market share in the US (after Chase).

As a result of this acquisition, the combined entity is divided into acceptance (40% of revenues), payments (36% of revenues), fintech (19% of revenues) and corporate & other (5% of revenues). We forecast a 5.3% growth rate for Fiserv's core banking software segment (Fintech), which is below the broader third-party banking software provider market, resulting in a small loss of market share of -0.9pp in 2021-2024E.

Exhibit 28: Fiserv standalone revenue split pre-merger
Payments solutions 56% of total revenues, Financial 44%



Source: Company reports

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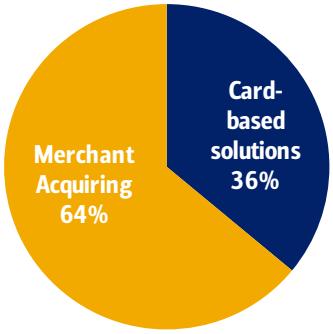
Exhibit 29: First Data standalone revenue split pre-merger
Card-based solutions 36% of total revenues, Merchant Acquiring 44%



Source: Company reports

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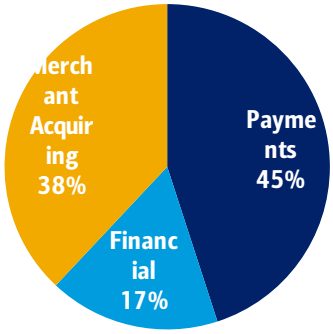
Exhibit 30: Combined entity revenue split post-merger
Payments 45% of total revenues, Merchant Acquiring 38%, Financial 17%



Source: Company reports

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Exhibit 31: Fiserv main disclosed clients with specific product usage
Fiserv is a popular provider for Tier 1 and Tier 2 banks, in core banking as well as account reconciliation and ERP financials

Customer	Vendor	Product
Tesco Bank	Fiserv	Fiserv Signature Banking Platform
Unity Bank Plc	Fiserv	Fiserv Corillian Online
Westpac Banking Group	Fiserv	Fiserv Corillian Online
United Nations Federal Credit Union	Fiserv	Fiserv DNA Platform
JPMorgan Chase & Co.	Fiserv	Fiserv Frontier Reconciliation
Wintrust Financial Corporation	Fiserv	Fiserv Frontier Reconciliation
United Comm Banks	Fiserv	Fiserv Premier
Washington Federal	Fiserv	Fiserv Prologue
Sainsburys Bank	Fiserv	Fiserv Prologue
Bank of Ceylon	Fiserv	Fiserv Signature Bank Platform
Fifth Third Bank	Fiserv	Fiserv Frontier Reconciliation
First Alliance Credit Union	Fiserv	Fiserv Interactive Branch Kiosk & Verifast Kiosk
Medisys Employees Federal Credit Union	Fiserv	Fiserv Loancierge (Lending Services)
Central Bank & Trust Co.	Fiserv	Fiserv Connected Teller for Signature
Union County Savings Bank	Fiserv	Fiserv Sentry Infrastructure Services Data Vaulting
MONETA Money Bank	Fiserv	Fiserv FirstVision (SaaS card processing platform)
Cadence Bank	Fiserv	Fiserv Anti-Money Laundering Risk Manager
Sunwest Bank	Fiserv	Fiserv Core Specification Services
Del-One Federal Credit Union	Fiserv	Fiserv Vantage Risk & Budgeting Manager
Truliant Federal Credit Union	Fiserv	Fiserv Frontier Reconciliation
Citi Financial	Fiserv	Fiserv Weiland BRMesdge (Treasury services)
Patriots Bank	Fiserv	Fiserv Core (migration)
Iriquois Federal Bank	Fiserv	Fiserv Premier Bank Platform
Metropolitan Commercial Bank	Fiserv	Fiserv Cleartouch Banking Platform
Manasquan Bank	Fiserv	Fiserv Cleartouch Banking Platform
Home Federal Bank	Fiserv	Fiserv Cleartouch Banking Platform
Quarry City Savings and Loan	Fiserv	Fiserv Cleartouch Banking Platform
Hawaii State Federal Credit Union	Fiserv	Fiserv DNA Core Platform
Seattle Credit Union	Fiserv	Fiserv DNA Core Platform
Allegacy Federal Credit Union	Fiserv	Fiserv DNA Core Platform
Claremont Savings Bank	Fiserv	Fiserv DNA Core Platform
Redstone Federal Credit Union	Fiserv	Fiserv DNA Core Platform

Source: Company press releases & website

BofA GLOBAL RESEARCH

Finastra – third-largest provider of banking software with share of 11%

Finastra (not covered) was formed in 2017 by the integration of Misys and D+H under the sponsorship of Private Equity firm Vista Equity Partners. The company serves clients in 130 countries, including 90 of the world's top 100 banks by asset size. With $1.85bn revenues in 2022, Finastra is the third-largest provider of banking software with a market share of 11%.

Finastra offers the market innovative, next-generation technology on its open Fusion software architecture and cloud ecosystem. It provides a full suite of pre-integrated solutions to financial institutions across the globe with products spanning retail banking, transaction banking, lending and treasury and capital markets.

Competitive advantage and differentiation strategy

Whilst Finastra is smaller than FIS and Fiserv, the company nonetheless boasts one of the broadest sets of financial software solutions on the market and is able to serve all functions of all types of financial institution. The company has developed unparalleled expertise in lending and its product portfolio in this sector is the best on the market. Finastra's strength in the lending space, coupled with its ability to handle all types of loans within a single platform, have led the company's differentiation and specialisation strategy. This has resulted in the targeting of community banks and commercially focused credit unions in need of lending software services.

Exhibit 32: Finastra main disclosed clients with specific product usage

Finastra is a popular provider for core banking services and has a particularly strong offering in lending services

Customer	Vendor	Product
Alaska USA Federal Credit Union	Finastra	Finastra Fusion LaserPro
Alior Bank	Finastra	Finastra Fusion Treasury
Am Bank	Finastra	Finastra Fusion Equation, Fusion Digital Channels, Fusion Digital Platform, Fusion Trade Innovation
ANZ	Finastra	Finastra Fusion Banking Loan IQ (loan mgt)
Askari Bank	Finastra	Finastra Fusion Trade Innovation
AYA Bank	Finastra	Finastra Fusion Corporate Channels, Digital Channels & Platform, Fusion Essence & Insight, Fusion Risk & Treasury & Trade Innovation
b1Bank	Finastra	Finastra Fusion Analytics
Banco CTT	Finastra	Finastra Fusion Essence Core Banking, Fusion Digital Banking Platform
Bank ABC	Finastra	Finastra Fusion Trade Innovation
Bank Aval	Finastra	Finastra Bankmaster Core Banking
BIDV Vietnam	Finastra	Finastra Fusion Treasury
Bank of Ceylon	Finastra	Finastra fusion Essence
Bank of Nova Scotia	Finastra	Finastra Fusion Core Banking
BankPlus	Finastra	Finastra Fusion LaserPro, Fusion DecisionPro
BBAC	Finastra	Finastra Fusion Equation, Fusion Teller, Fusion Trade Innovation
Beacon Credit Union	Finastra	Finastra Fusion LaserPro, Fusion DecisionPro
Belize Bank	Finastra	Finastra Fusion Essence Core Banking
BNP Paribas S.A.	Finastra	Finastra Fusion Lender Blockchain Platform
CenterState Bank	Finastra	Finastra Total Lending Commercial
China Re Asset Management	Finastra	Finastra Fusion Invest
CIH Bank	Finastra	Finastra Fusion Corporate Channels
Citizens Savings & Loan	Finastra	Fianstra Fusion Phoenix
Commencement Bank	Finastra	Finastra Fusion Phoenix, Fusion Digital Banking
Commercial Bank Egypt	Finastra	Finastra FusionBanking Corporate Channels, FusionBanking Trade Innovation
Commonwealth Bank	Finastra	Finastra Fusion Managed Services (Tech services)
Credit Agricole CIB	Finastra	Finastra Fusion Corporate Channels
Ecobank	Finastra	Finastra Fusion Cash Management
Firefighters First Credit Union	Finastra	Finastra Preferred Active Support
Guotai Junan International	Finastra	Finastra Fusion Sophis, Fusion Adopt
Habib Bank Limited	Finastra	Finastra Fusion Corporate Channels, Fusion Trade Innovation, Fusion Equation, Fusion Message Manager, Fusion Risk
Horicon Bank	Finastra	Finastra Fusion Pheonix, Fusion DepositPro, Fusion LaserPro
Hoyne Savings Bank	Finastra	Finastra Fusion LaserPro, Fusion Mortgagebot
Iccrea Banking group	Finastra	Finastra Fusion Prost-Trade
IFIC Bank	Finastra	Finastra Fusion Equation, Fusion Trade Innovation, Fusion Digital Channels, Fusion Corporate Channels
Ilmarinen Mutual Pension Insur.	Finastra	Finastra Fusion Invest (Investment Management Services)
Íslandsbanki	Finastra	Finastra Fusion Treasury, Fusion Risk
Itau BBA	Finastra	Finastra Fusion Kondor
JGP Asset Management	Finastra	Finastra Fusion Invest
Jordan International Bank	Finastra	Finastra Fusion Equation Lending Services

Exhibit 32: Finastra main disclosed clients with specific product usage
Finastra is a popular provider for core banking services and has a particularly strong offering in lending services

Customer	Vendor	Product
KBZ	Finastra	Finastra Fusion Treasury
Lea County State Bank	Finastra	Finastra Fusion Phoenix, Fusion Digital Banking
Mainstreet Community Bank	Finastra	Finastra Fusion LaserPro, Fusion DecisionPro, Fusion CreditQuest
Mediobanca	Finastra	Finastra Fusion Loan IQ, Fusion Advance
National Bank of Bahrain	Finastra	Finastra Fusion Kondor, Fusion Advance
Natixis	Finastra	Finastra Fusion Summit OTC Trading
NORD/LB	Finastra	Finastra Fusion Banking Loan IQ (loan mgt)
Northwest Federal Credit Union	Finastra	Fianstra Fusion Mortgagebot Lending Services
Oversea-Chinese Banking	Finastra	Finastra Fusion Opics Treasury Solution
Puerto Rico Federal Credit Union	Finastra	Finastra Fusion Digital Banking Platform
Qatar International Islamic Bank	Finastra	Finastra Fusion Islamic
Renasant Bank	Finastra	Fusion Mortgagebot
Seattle Bank	Finastra	Finastra Fusion Pheonix, Fusion Digital Banking, FusionFabric.cloud
Seylan Bank	Finastra	Finastra Fusion Equation, Fusion Trade Innovation, Fusion Corporate Channels
SFIL	Finastra	Finastra Fusion Summit
Shanghai Pudong Dev. Bank	Finastra	Finastra Fusion Summit, Fusion Adopt
Silvergate	Finastra	Finastra Fusion Global PAYplus
Société Générale	Finastra	Finastra FusionBanking Midas Core Banking
State Bank of Southern Utah	Finastra	Finastra Fusion uOpen, Fusion DecisionPro, Fusion LaserPro
The Bank of New York Mellon Corp	Finastra	Finastra Fusion Lender Blockchain Platform
The United Bank of Egypt	Finastra	Finastra Fusion Equation Core Banking, Fusion Treasury & Fusion Risk
TMF Group	Finastra	Finastra Fusion Loan IQ
United Arab Bank	Finastra	Finastra Fusion Corporate Channels & Fusions Cash Management
Yoma Bank	Finastra	Finastra Fusion Digital Channels, Fusion Digital Platform, Fusion Essence
ZB Financial Holdings	Finastra	Finastra Fusion Equation, Finastra Fusion Digital Channels

Source: Company press releases & website

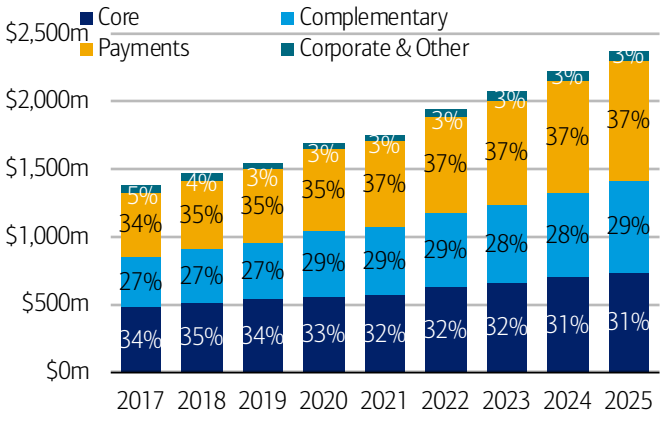
BofA GLOBAL RESEARCH

Jack Henry – tradition of focusing on smaller banks with up to $50bn in assets

Jack Henry & Associates was founded in 1976 as a provider of core information processing solutions to community banks. Today, the vendor services more than 9,000 customers across more than 3,000 products. Jack Henry (covered by BofA Global Research analyst Jason Kupferberg) has historically targeted smaller banks with up to $50bn in assets and credit unions, thereby securing a loyal customer base and 7% share of the global market.

We estimate 60% of the company's total revenues stem from core banking system software (Core) and associated software modules (Complementary) – we expect this to remain stable. In 2017-2022, the Core segment grew at a 5.4% CAGR and the Complementary segment at an 8.2% CAGR. Together, they grew at a 6.7% CAGR. However, YoY segment growth is volatile and seems to be slowing (excluding the outlier year of 2020, which is distorted by COVID 19).

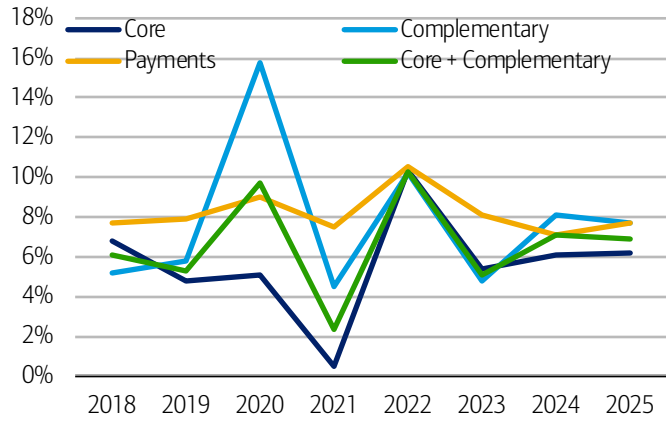
Exhibit 33: Jack Henry revenue evolution and split by business line
Core & Complementary account for 32% and 28% of total revenues. Payments account for 37% and Corporate & Other for 3% of total revenues



Source: BofA Global Research estimates, company data

BofA GLOBAL RESEARCH

Exhibit 34: Jack Henry business lines historical growth rate
Core + Complementary growing at mid-single digit rate



Source: BofA Global Research estimates, company data

BofA GLOBAL RESEARCH

Banking software solutions & differentiation strategy

For banks, Jack Henry offers three core banking platforms:

1. **SilverLake:** A robust system primarily designed for commercial-focused banks with assets ranging from $500m to $50bn. Some progressive smaller banks and start-up banks also select SilverLake. This system is in use by over 400 banks and automates over 8% of US banks with assets less than $50bn.

2. **CIF 20/20:** A parameter-driven, easy-to-use system that now supports approximately 360 banks ranging from de novo institutions to those with assets of $3bn.

3. **Core Director:** A cost-efficient system with point-and-click operation that now supports nearly 200 banks ranging from start-ups to institutions with assets of $2bn.

Jack Henry also offers a core credit union platform:

- **Episys:** A robust system designed specifically for credit unions, implemented by over 700 with assets ranging from $3mn to $25bn. According to National Credit Union Administration data, this system is implemented by more credit unions with assets exceeding $25m than any alternative core system.

The company also offers more than 140 complementary products and services for core banks and 100 for credit unions. It is consistently praised for its high level of customer involvement from its management team and its focus on service, as well as for the seamless integration of its products and services across its platform.

Nonetheless, Jack Henry has also been criticised, mostly for (1) its difficult onboarding/account-opening; (2) some gaps in its offering, specifically in terms of treasury management; and (3) the platform's incompatibility with numerous third-party offerings that cannot be integrated.

Exhibit 35: Jack Henry & Associates main disclosed clients with specific product usage
Jack Henry & Associates is specifically popular with Tier 2 and 3 American banks

Customer	Vendor	Product
First Florida Integrity Bank	Jack Henry & Associates	JHA Silverlake System Core Platform; Processing Services
Cashmere Valley Bank	Jack Henry & Associates	JHA Silverlake System Core Platform; Client Services Engagement
Cornerstone Bank	Jack Henry & Associates	JHA Client Services Consulting
Charter Bank	Jack Henry & Associates	JHA Client Services Consulting
Farmers Trust and Savings Bank	Jack Henry & Associates	JHA CIF 20/20 Core Platform
Citizens National Bank	Jack Henry & Associates	JHA PowerOn
Camden National Bank	Jack Henry & Associates	JHA Call Center
River Valley Bank	Jack Henry & Associates	JHA SilverLake System Core Platform; Banno Mobile; Synapsys (CRM); Yellow Hammer Fraud Detective
First Commonwealth Bank	Jack Henry & Associates	JHA Silverlake System Core Platform
Isabella Bank Corporation	Jack Henry & Associates	JHA SilverLake System Core Platform; Centurion Hosted High Availability
Central Bank	Jack Henry & Associates	JHA CIF 20/20
Lone Star National Bank	Jack Henry & Associates	JHA ArgoKeys DepositKeys
South State Bank	Jack Henry & Associates	JHA Banking SilverLake System

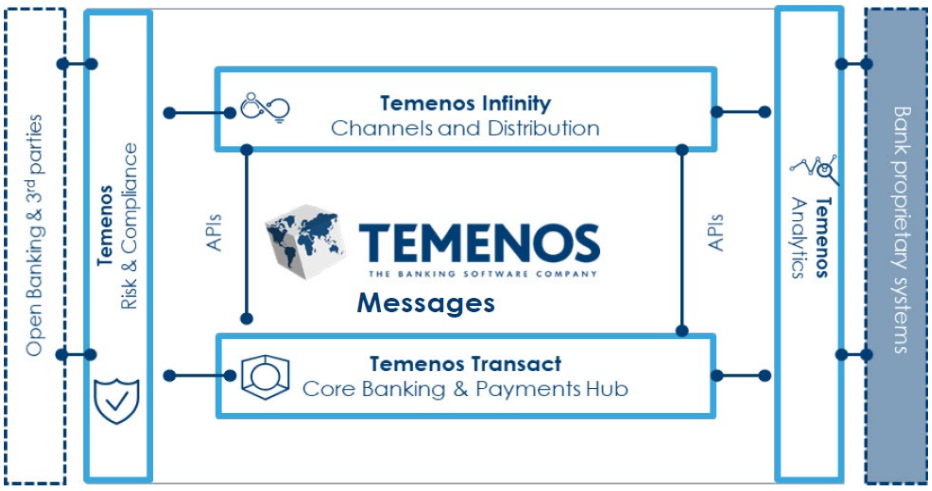
Source: Company press releases & website

BofA GLOBAL RESEARCH

Temenos – replacing ageing banking systems with modern technology

Temenos is a leading global banking software vendor. The Geneva-based company was originally created in 1993, with the aim of replacing ageing banking systems with state-of-the-art technology. Temenos' products are independently deployable and are based on a common set of capabilities and design principles to drive increased analytical insight and product agility, and to reduce the cost of operation and ownership. All of them are built and delivered on a single code base so that all clients can benefit from the latest capabilities and feedback into the same set of underlying solutions.

Exhibit 36: Architecture of Temenos' core products
Digital banking platform (Infinity) and Core Banking Solution (Transact) are the founding blocks of Temenos' offering



Source: Company report

BofA GLOBAL RESEARCH

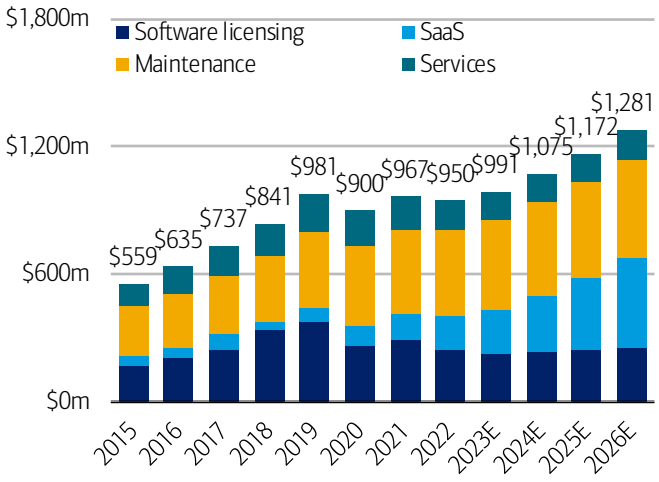
Formerly known as T24, Temenos Transact is the company's core banking product. It provides core banking functionalities across retail, corporate, treasury, wealth and payments with over 1,000 banks in 150 countries. It offers a customer-centric core banking solution. It can be deployed as separate components but also works with out-of-the box integration across all solution components and an extensive set of Open APIs to make integration to external systems easier.

Temenos Transact also benefits from other integrated functionality and technology, such as data and analytics and the latest enhancements to the Temenos technological capabilities. These include increasing exposure of Temenos Transact's Open APIs in the growing API catalogue, and the new extensibility framework that delivers embedded DevOps for continuous delivery and integration.

The product offers support for a wide range of banking sectors, including Retail, SME, Corporate, Wealth, Inclusive and Islamic Banking segments. The functionality is designed for global use and enhanced by the Country Model Bank configurations maintained by Temenos, which provide packaged support for regional banking requirements.

Temenos also offers digital banking platform capabilities (Temenos Infinity) as well as Payments, Risk & Compliance and Analytics capabilities.

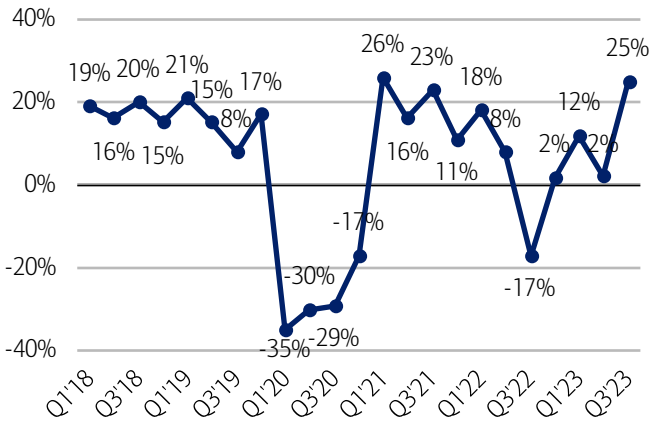
Exhibit 37: Temenos revenue split 2015-2026E
We forecast 5/8% CAGR for total revenues during the period 2021-2026, reaching $1.3bn in 2026



Source: BofA Global Research estimates, company disclosure

BofA GLOBAL RESEARCH

Exhibit 38: Temenos total software licensing quarterly growth
Software licensing becoming a significantly smaller component of total software licensing



Source: Company disclosure

BofA GLOBAL RESEARCH

The company enjoyed a c.10% revenue CAGR from 2015 until 2021, with a drop in revenues in 2020 due to COVID-19, and in 2022 on mixed customer traction. We continue to forecast a growth rate just below 9% until 2026, given the (1) focus on acquiring new Tier 1 and 2 clients in the US; (2) low wallet share with existing customers; and (3) strength in the relatively less competitive fields of neo-banks and Islamic banking.

Exhibit 39: Temenos main disclosed clients with specific product usage
Temenos platform and solutions are popular with a broad range of players, many of which in the MENA region due to strength of Islamic finance offering

Customer	Vendor	Product
Agricultural Bank of China	Temenos	Temenos Infinity, Temenos Transact
Bank of Montreal	Temenos	Temenos Infinity, Temenos Transact
Credit Suisse Group	Temenos	Temenos Infinity, Temenos Transact
Commerzbank AG	Temenos	Temenos Infinity, Temenos Transact
Credit Suisse Group	Temenos	Temenos FundSuite
ABN AMRO Bank NV	Temenos	Temenos Transact; Temenos Infinity Wealth
Banchile Inversiones	Temenos	Temenos Infinity Wealth (ex WealthSuite)
HSBC North America	Temenos	Temenos Infinity
Arab Investment Bank	Temenos	Temenos Infinity; Temenos Payments
ACLEDA	Temenos	Temenos Transact
Bank of Shanghai	Temenos	Temenos Transact
NCBA Bank	Temenos	Temenos Transact
Al Ain Finance PJSC	Temenos	Temenos Infinity, Temenos Transact, Temenos Banking Cloud
Al Khaliki Bank	Temenos	Temenos Transact
Al Rajhi	Temenos	Temenos Infinity, Temenos Transact, Temenos Loan Origination
Alba	Temenos	Temenos Infinity, Temenos Transact, Temenos Banking Cloud
Alejma'a Alarabi Bank	Temenos	Temenos Transact, Temenos Data & Analytics, Temenos Payments, Temenos Infinity and Temenos Financial Crime Mitigation
Alex Bank	Temenos	Temenos Infinity, Temenos Transact, Temenos Banking Cloud
Allied Bank	Temenos	Temenos Infinity, Temenos Transact
Alpian	Temenos	Temenos Transact, Temenos Payments, Temenos Banking Cloud
Arab Tunisian Bank	Temenos	Temenos Transact, Temenos Infinity, Temenos Data & Analytics, Temenos Payments and Temenos Financial Crime Mitigation
ARB Apex Bank	Temenos	Temenos Transact, Temenos Infinity, Temenos Payments and Temenos Risk and Compliance
ATIB - Assaray Trade & Invest. Bank	Temenos	Temenos Transact, Temenos Infinity, Temenos Analytics, and Temenos Payments
Atlantic Union Bank	Temenos	Temenos Infinity
Azur	Temenos	Explainable AI (XAI)
Banco Azul	Temenos	Temenos Transact
Banco Bolivariano	Temenos	Temenos Infinity, Temenos Banking Cloud
Banco del Sol	Temenos	Temenos Transact, Temenos Financial Mitigation, and Temenos Data & Analytics
Banco Itau	Temenos	Temenos Wealth, Temenos Wealth Front Office, Temenos Transact
Banco Multiva	Temenos	Temenos Transact
Bank Albilad	Temenos	Temenos Transact, Temenos IslamicSuite, and Temenos Digital Channels
Bank Alfalah	Temenos	Temenos Transact, Temenos Data Framework

Exhibit 39: Temenos main disclosed clients with specific product usage

Temenos platform and solutions are popular with a broad range of players, many of which in the MENA region due to strength of Islamic finance offering

Customer	Vendor	Product
Bank of Khyber	Temenos	Temenos Transact, Temenos Infinity, Temenos Financial Crime Mitigation, and Temenos Analytics solutions
Bank of Kigali	Temenos	Temenos Transact, Temenos Payments
Bank of Shanghai	Temenos	Temenos Transact
Bank SinoPac	Temenos	Temenos Transact
Banque Cantonale Vaudoise	Temenos	Temenos Proposal Generator
Banque de l'Habitat	Temenos	Temenos Transact, Temenos Data & Analytics, Temenos Infinity, Temenos Financial Crime Mitigation, and Enterprise Risk Management
Banque du Caire	Temenos	Temenos Infinity, Temenos Transact
Banque Raiffeisen Luxembourg	Temenos	Temenos Infinity, Temenos Transact
Baobab	Temenos	Temenos Infinity, Temenos Transact
Barko Financial Services	Temenos	Temenos Infinity, Temenos Transact
Baxter Credit Union (BCU)	Temenos	Temenos Infinity (Microsoft Azure Cloud)
BCCL	Temenos	Temenos Transact (Oracle 11 database, Red Hat server)
Banco de Credito e Inversiones	Temenos	Temenos Infinity, Temenos Transact, Temenos Payments
Beyond Bank	Temenos	Temenos Infinity
BHD Leon	Temenos	Temenos Transact
Blueshore Financial	Temenos	Temenos Infinity, Temenos Transact, Temenos Data & Analytics, Temenos edgeConnect
BMCE Bank of Africa	Temenos	Temenos Transact, Temenos Financial Crime Mitigation
British Business Bank	Temenos	Explainable AI (XAI)
Byblos Bank	Temenos	Temenos Transact
Canadian Western Bank	Temenos	Temenos Transact, Temenos Infinity, Temenos Data & Analytics, Temenos Data Lake with Explainable AI (XAI)
Canandaigua National Bank	Temenos	Temenos Infinity
CB Bank	Temenos	Temenos Transact
Centris Federal Credit Union	Temenos	Temenos Infinity
CFG	Temenos	Temenos Infinity
CIBanco	Temenos	Temenos Transact
Coast Capital Savings	Temenos	Temenos Transact
Commerce Bank	Temenos	Temenos Transact
Consolidated Bank Ghana	Temenos	Temenos Transact
Credit Du Maroc	Temenos	Temenos Transact, Temenos Payments
Credit Suisse	Temenos	Workflow and Exception Manager module within Multifonds Global Accounting
Croí Laighean	Temenos	Temenos community banking solutions
Egyptian National Post Organization	Temenos	Temenos Infinity, Temenos Transact, Advanced Analytics
EQ Bank	Temenos	Temenos Transact
Eurobank	Temenos	Temenos Infinity, Temenos Transact, Temenos Wealth Front Office
Federal Bank of Lebanon	Temenos	Temenos Transact, Temenos Insight
FinaBAnk	Temenos	Temenos Infinity, Temenos Transact, Temenos Financial Crime Mitigation
Finaro	Temenos	Temenos Transact
FINCI	Temenos	Temenos Transact, Temenos Payments, Temenos Financial Crime Mitigation
First Tech Federal Credit Union	Temenos	Temenos Infinity
FirstOntario Credit Union	Temenos	Temenos Infinity, Temenos Transact
FlowBank	Temenos	Temenos Transact, Temenos Banking Cloud
Flowe	Temenos	Temenos Transact, Temenos Banking Cloud, Temenos Payments, Temenos Financial Crime Mitigation
FORUM Credit Union	Temenos	Temenos Infinity Loan Origination,
Green Dot	Temenos	Temenos Banking Cloud
Hattha Bank	Temenos	Temenos Infinity
Hiway Federal Credit Union	Temenos	Temenos Infinity Collection module
HSBC North America	Temenos	Credit card onboarding and origination project
HUB24	Temenos	Temenos Infinity Journey Manager, Temenos Banking Cloud
Hume Bank	Temenos	Temenos onboarding solution
Husbanken	Temenos	Temenos Transact, Temenos Financial Crime Mitigation solutions
ING Belgium	Temenos	Temenos Wealth Front Office (private cloud)
Johnson Bank	Temenos	Temenos Collection
Jordan Ahli Bank	Temenos	Temenos Infinity, Temenos Transact
JS Bank	Temenos	Temenos Transact Treasury
Judo Bank	Temenos	Temenos Transact, Temenos Banking Cloud
Julius Baer	Temenos	Temenos Wealth
Julius Baer	Temenos	Temenos Transact
KAF	Temenos	Temenos Transact, Temenos Banking Cloud
KBC Ireland	Temenos	Temenos Transact
Al Kuraimi Islamic Bank	Temenos	Temenos Infinity, Temenos Transact
Komer [illegible]	Temenos	Temenos Transact
LarrainVial	Temenos	Temenos Transact
LBS Financial Credit Union	Temenos	Temenos Infinity Collection
Lunar	Temenos	Temenos Financial Crime Mitigation

Exhibit 39: Temenos main disclosed clients with specific product usage
Temenos platform and solutions are popular with a broad range of players, many of which in the MENA region due to strength of Islamic finance offering

Customer	Vendor	Product
M1 Finance	Temenos	Temenos Banking Cloud, Temenos Transact, Temenos Payments
Mauritius Commercial Bank	Temenos	Temenos Transact
Metro Bank	Temenos	Temenos Infinity, Temenos Transact
MIDBANK	Temenos	Temenos Infinity, Temenos Transact
Military Commercial J. S. Bank	Temenos	Temenos Wealth Front Office, Temenos Transact
Millennium Trust Company	Temenos	Temenos Infinity
Mizrahi Tefahot	Temenos	Temenos Transact
MMG Bank	Temenos	Temenos Transact
Municipality Finance Plc	Temenos	Temenos Transact
MyLife MyFinance	Temenos	Temenos Transact, Temenos Infinity, Temenos Analytics, Temenos Banking Cloud
MyState	Temenos	Temenos Infinity, Temenos Banking Cloud
NATCCO	Temenos	Temenos Mobile Payment System
National Bank of Malawi	Temenos	Temenos Transact
NCBA Bank	Temenos	Temenos Transact
Next Commercial Bank	Temenos	Temenos Transact
Nordea Investment Funds	Temenos	Temenos Multifonds
Northern Trust	Temenos	Temenos Multifonds Global Investor (fund administration platform)
Nova Ljubljanska Banka	Temenos	Temenos Transact
Nuestra Caja	Temenos	Temenos Transact
O-Bank	Temenos	Temenos Transact
Openbank	Temenos	Temenos Transact, Temenos Wealth Front Office
Orange Bank Africa	Temenos	Temenos Transact
ORNL Federal Credit Union	Temenos	Temenos Infinity Retail Banking App
Palestine Islamic Bank	Temenos	Temenos Infinity, Temenos Transact
Partners Federal Credit Union	Temenos	Temenos Infinity *(originally Kony solution)*
Prestanómico	Temenos	Temenos Transact
PSECU	Temenos	Temenos Infinity Loan Origination *(originally Kony solution)*
RACQ Bank	Temenos	Temenos Infinity
Royal Credit Union	Temenos	Temenos Infinity
Santander International	Temenos	Temenos Banking Cloud
SASCU	Temenos	Temenos Analytics
Schroders	Temenos	Temenos Wealth Front Office, Temenos Transact
Seychelles Credit Union	Temenos	Temenos Transact
Silkbank	Temenos	Temenos Infinity, Temenos Transact
Société Generale	Temenos	Temenos Transact, Temenos Payments
SomBank	Temenos	Temenos Infinity, Temenos Transact
Standard Bank	Temenos	Temenos Transact
Standard Chartered	Temenos	Temenos Multifonds
Stanford Federal Credit Union	Temenos	Temenos Infinity Loan Origination
State Bank of Pakistan	Temenos	Temenos Transact
STCPay	Temenos	Temenos Transact, Temenos Payments (RedHat)
Suez Canal Bank	Temenos	Temenos Infinity
Swissquote	Temenos	Temenos Transact, Temenos Integration Framework
Truevo	Temenos	Temenos Infinity, Temenos Transact, Temenos Payments, Temenos Financial Crime Mitigation
Trusted Novus Bank	Temenos	Temenos Infinity, Temenos Transact, Temenos Banking Cloud
TSB	Temenos	Temenos Infinity
U Microfinance Bank	Temenos	Temenos Infinity, Temenos Transact
Uniting Financial Services	Temenos	Temenos Infinity, Temenos Transact, Temenos Financial Crime Mitigation, Temenos Banking Cloud
UBL	Temenos	Temenos Infinity
Varo Bank	Temenos	Temenos Infinity, Temenos Transact, Temenos Payments
Virgin Money Australia	Temenos	Temenos Infinity, Temenos Transact, Temenos Banking Cloud
Vista Bank	Temenos	Temenos Infinity, Temenos Transact
Volkswagen Financial Services	Temenos	Temenos Transact
Volt Bank	Temenos	Temenos Transact (Microsoft Azure Cloud)
WB Finance	Temenos	Temenos Transact

Source: Company press releases & website

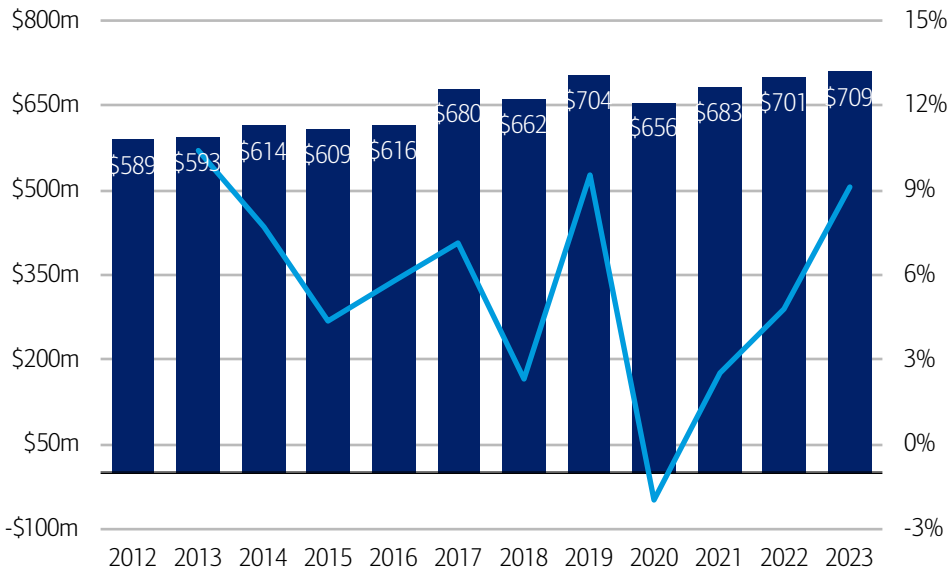
BofA GLOBAL RESEARCH

Oracle FSS – 600+ retail banking software solutions use its universal banking

Oracle Financial Services Software (Oracle FSS) is a subsidiary of Oracle (covered by BofA Global Research analyst Brad Sills). The company is a world leader in providing IT solutions to the financial services industry. Oracle FSS offers financial institutions a comprehensive suite of banking applications and a technology footprint that addresses their complex IT and business requirements. 600+ retail banking software solutions use the company's universal banking products in 140+ countries across the globe.

Oracle FSS' offering includes retail, corporate and investment banking solutions, with modules in funds, cash management, trade, treasury, payments, lending, asset management, compliance, enterprise risk and business analytics as well as anti-financial crime. The product business (product licensing, consulting and support) is also complemented by PrimeSourcing (OFSS' consulting service) and the Business Process Outsourcing (BPO) services.

Exhibit 40: Oracle Financial Services Software (FSS) revenue & growth since 2012
Revenue CAGR of 5.5% during the 2012-2023 period



Source: Company data

BofA GLOBAL RESEARCH

We believe that the Oracle FSS divisions may struggle to remain competitive against highly specialised companies in banking software with independent decision-making that also provides them with additional operational flexibility. We believe this will be the case for Tier 1 banks that may prefer leading market providers such as FIS, Fiserv or Finastra or Temenos, who can also provide synergies with their offerings in payments and lending.

Banking software solutions & differentiation strategy

Oracle FSS' flagship product is Oracle Flexcube. It is a complete banking solution for retail, corporate and investment banking, consumer lending, asset management and investor servicing, including payments. The solution offers financial institutions the agility to adapt architectures to suit different transformation paths and diverse operating business models through a set of composable modules. Those components are standalone, enterprise-grade systems, thereby enabling seamless configurability and ease of integration and deployment to work with existing product processors within a bank's existing IT framework.

One of Oracle Flexcube's main strength resides in its seamless integration with the rest of Oracle's offering, and specifically the possibility of deployment on Oracle Cloud Infrastructure (OCI) Public Cloud, thereby allowing financial institutions to leverage

access to a set of complementary cloud services in a highly available hosted environment.

Exhibit 41: Oracle main disclosed clients with specific product usage
Oracle Flexcube core banking software is popular with clients who also use Oracle's ERP solutions

Customer	Vendor	Product
Banco do Brasil	Oracle	Oracle Flexcube
Citigroup Inc.	Oracle	Oracle Flexcube
Wells Fargo & Company	Oracle	Oracle Flexcube
HSBC Bank plc	Oracle	Oracle Flexcube
Lloyds Banking Group	Oracle	Oracle Flexcube
Federal Deposit Insurance	Oracle	Oracle Flexcube
Ocwen Financial Corporation	Oracle	Oracle Flexcube
Mizuho Bank	Oracle	Oracle Flexcube
HDFC Bank	Oracle	Oracle Flexcube
Wingbank	Oracle	Oracle Flexcube
JPM Chase	Oracle	Oracle Flexcube
ZamZam Bank Ethiopia	Oracle	Oracle Flexcube

Source: Company press releases & website

BofA GLOBAL RESEARCH

Finacle (Infosys) – serves 1 billion end-customers worldwide

Finacle, developed by Infosys (covered by BofA Global Research analyst Kunal Tayal), is a cloud-based core banking solution that helps financial institutions modernise their cloud-based banking services. The platform is used by banks in 100+ countries and serves 1 billion end-customers worldwide, backing banking technology companies.

With open APIs, embedded customer insights, and a real-time processing engine, Finacle banking systems software offers a comprehensive set of features designed to accelerate innovation-led growth. The highly modular solution was designed to speed up the production of new products and accelerate digital adoption.

Finacle solutions address the core banking, omnichannel banking, payments, treasury, origination, liquidity management, Islamic banking, wealth management, analytics, artificial intelligence, and blockchain requirements of financial institutions to drive business excellence. These solution are available for on-premise deployments or as cloud-hosted banking platforms. The solution's componentised structure and enterprise-class capabilities help banks boost the agility and efficiency of their operations and significantly improve customer experience across channels.

Exhibit 42: Finacle main disclosed customers with specific product usage
Finacle banking software solutions are especially popular in developing countries such as India given proximity of parent firm Infosys

Customer	Vendor	Product
IndusInd Bank	Finacle	Finacle Assure
National Bank of Bahrain	Finacle	Finacle Cash Management Suite, Corporate Online Banking Platform, Digital Engagement Suite
Bank Rakyat Indonesia (BRI)	Finacle	Finacle Digital Engagement Suite
African Export-Import Bank	Finacle	Finacle Digital Engagement Suite, Core Banking Solution Suite, Finacle Online Banking
UnionBank of the Philippines	Finacle	Finacle Digital Engagement Suite
Standard Bank Group	Finacle	Finacle Digital Engagement Suite
Federal Bank of India	Finacle	Finacle Core Banking Solution
Al Ahli of Kuwait	Finacle	Finacle Digital Engagement Suite
RBL Bank India	Finacle	Finacle Digital Engagement Suite
Shivalik Bank	Finacle	Finacle Digital Engagement Suite, Finacle Core Banking Solution
Australian Military Bank	Finacle	Finacle Digital Banking Suite (Core Banking, Customer Information, Alerts, Retail Loan Origination, Payments, Online & Mobile Banking)
Punjab National Bank	Finacle	Finacle Mobile Banking Solution, Digital Engagement Hub
Rakbank	Finacle	Finacle Digital Engagement Suite & Hub, Finacle Mobile Banking
National Commercial Bank Jamaica	Finacle	Finacle Digital Engagement Suite
Emirates NBD	Finacle	Finacle Core Banking Solution, Finacle Trade Connect
Kotak Mahindra Bank	Finacle	Finacle Trade Connect
Bank Dhofar Oman	Finacle	Finacle Digital Engagement Suite
Bank Muscat	Finacle	Finacle Digital Engagement Suite
ICICI Bank	Finacle	Finacle Core Banking, Online Banking, Trade Connect, Payments Connect
Equity Bank	Finacle	Finacle Online Banking Solution
Santander UK	Finacle	Finacle Digital Engagement Suite, Finacle Corporate Banking Suite
Bank Sohar Oman	Finacle	Finacle Core Banking Solutions & embedded Analytics solutions
State Bank of Mauritius	Finacle	Finacle Digital Engagement Suite
PMC Bank	Finacle	Finacle Core Banking Solutions
MCS Mutual Aid Association	Finacle	Finacle Online & Mobile Banking Solution
I&M Bank	Finacle	Finacle Digital Engagement Suite
MAU Bank	Finacle	Finacle Core Banking Solutions
South Indian Bank	Finacle	Finacle Core Banking Solutions
Golomt Bank	Finacle	Finacle Core Banking Solutions
First Bank of Nigeria	Finacle	Finacle Core Banking Solutions
State Bank of India	Finacle	Finacle Core Banking Solutions
RCBC	Finacle	Finacle Core Banking Solutions
DFCU Bank	Finacle	Finacle Core Banking Solutions
Mauritius Post and Coop Bank	Finacle	Finacle Core Banking Solutions
ING VYSYA Bank	Finacle	Finacle Core Banking Solutions
Bank One Limited	Finacle	Finacle Core Banking Solutions
Wema Bank	Finacle	Finacle Core Banking Solutions
Axis Bank	Finacle	Finacle Core Banking Solutions
Cosmost Bank	Finacle	Finacle Core Banking Solutions
Fidelity Bank Nigeria	Finacle	Finacle Core Banking Solutions
Post Bank Uganda	Finacle	Finacle Core Banking Solutions
Banca Mifel	Finacle	Finacle Core Banking Solutions

Exhibit 42: Finacle main disclosed customers with specific product usage
Finacle banking software solutions are especially popular in developing countries such as India given proximity of parent firm Infosys

Customer	Vendor	Product
DFCU Bank	Finacle	Finacle Core Banking Solutions, Finacle Online Banking
Indusind Bank	Finacle	Finacle Core Banking Solutions, Finacle Assure
Union Bank of the Philippines	Finacle	Finacle Core Banking Solutions
Tamilnad Mercantile Bank	Finacle	Finacle Core Banking Solutions
Bacolombia	Finacle	Finacle Core Banking Solutions
Karnataja Bank	Finacle	Finacle Core Banking Solutions
Tbank	Finacle	Finacle Core Banking Solutions
Victoria Commercial Bank	Finacle	Finacle Core Banking Solutions
ING Belgium	Finacle	Finacle Core Banking Solutions
HPB	Finacle	Finacle Core Banking Solutions
RakBank	Finacle	Finacle Core Banking Solutions
Bank Sohar	Finacle	Finacle Core Banking Solutions
Brac Bank	Finacle	Finacle Core Banking Solutions

Source: Company press releases & website

BofA GLOBAL RESEARCH

Mambu – relative newcomer is rapidly growing supplier of banking solutions

As a relative newcomer, core banking software vendor Mambu has established itself as a rapidly growing supplier of banking solutions. In the two years since its founding in 2011, Mambu's platform has been adopted by 100 microfinance organisations in 26 countries around the world. Today, the Berlin-based start-up services more than 260 customers with over 101m end users. Mambu helps top financial software companies like Santander or N26 to rapidly design, launch, and scale their digital-first banking and lending services. Over 55% of its new customers are from outside of Europe, and 40% of new banks in the UK today run on Mambu's platform.

Differentiation strategy: cloud-native & composable banking solution

Mambu's key competitive advantage rests on its offering, which is (1) cloud-native; and (2) composable. Indeed, Mambu is one of the first providers to have developed a cloud-native banking software offering, i.e., an offering that was architected from the ground up on the cloud (rather than migrated on it) – this means the system was designed to take advantage of cloud-based technologies, notably in terms of accessibility and scalability. For example, cloud technology enables banks to manage their resources on demand, enhance the accessibility of customer data, while also offering the agility needed to process data in real time. As a result, the technology stack of Mambu's platform is far superior in quality, scalability and flexibility to those legacy providers.

Mambu's platform is also based on the concept of composability: the core offering consists of a core banking layer that focuses solely on basic consumer data, ledger, lending and deposit capabilities. At the same time, the platform provides seamless integration connectors that enable customers to integrate the best-of-breed providers across the technology stack. The core idea is to take full advantage of the disintermediation of banking software: the client can design its platform using the best providers across different capabilities (i.e., payment processing, CRM, fraud & compliance, etc.).

With banking software built from the cloud upwards, Mambu's SaaS engine is an alternative to costly and complex traditional core banking systems. Indeed, the company started off as a provider of lending software services for small financial institutions and neo-banks – to this day, it does not have the capacity to service larger banks but has enjoyed tremendous success with lower Tier banks across the world. By design, Mambu's platform was tailored to cater for retail banking, although the offering has since expanded to commercial banking as well.

Exhibit 43: Mambu main disclosed customers with specific product usage

Mambu cloud banking platform is used for both greenfield and migration projects in the retail and SME banking sectors

Customer	Vendor	Product
365.bank	Mambu	Cloud Banking Platform (Retail Core migration)
ank	Mambu	Cloud Banking Platform (Cloud wallet)
BancoEstado	Mambu	Cloud Banking Platform (Retail Core migration)
Bank Islam	Mambu	Cloud Banking Platform (Islamic Banking)
Bluestone	Mambu	Cloud Banking Platform (Lending services)
Cake	Mambu	Cloud Banking Platform (Retail Core migration)
CapitalBox	Mambu	Cloud Banking Platform (Retail Core migration)
FIBR	Mambu	Cloud Banking Platform (SME Core greenfield)
Fixura	Mambu	Cloud Banking Platform (Retail Core migration)
GBB	Mambu	Cloud Banking Platform (Tailored Core)
UAB General Financing	Mambu	Cloud Banking Platform (Core greenfield integrated with legacy systems)
Greameen America	Mambu	Cloud Banking Platform (Retail Core migration)
Iris	Mambu	Cloud Banking Platform (SME Core greenfield)
Kwara	Mambu	Cloud Banking Platform (Financial Cooperative Core greenfield)
League Data	Mambu	Cloud Banking Platform (Credit Union Core migration)
LNDDO	Mambu	Cloud Banking Platform (SME Core greenfield)
Lumi	Mambu	Cloud Banking Platform (SME Core greenfield)
MACH	Mambu	Cloud Banking Platform (Retail Core migration)
My Community Finance (MCF)	Mambu	Cloud Banking Platform (Credit Union Core migration)
Mynt	Mambu	Cloud Banking Platform (Retail Core migration)

Exhibit 43: Mambu main disclosed customers with specific product usage
Mambu cloud banking platform is used for both greenfield and migration projects in the retail and SME banking sectors

Customer	Vendor	Product
N26	Mambu	Cloud Banking Platform (Retail Core migration)
New10 (ABN AMRO)	Mambu	Cloud Banking Platform (Tailored Core)
Nordiska	Mambu	Cloud Banking Platform (FinTech Core migration)
OakNorth	Mambu	Cloud Banking Platform (SME Tailored Core)
Personal Finance Co. (PFC)	Mambu	Cloud Banking Platform (Personal Banking Tailored Core)
Rebellion	Mambu	Cloud Banking Platform (Retail Core migration)
Recognise	Mambu	Cloud Banking Platform (SME Core migration)
Solarisbank	Mambu	Cloud Banking Platform (FinTech Core migration)
TBC-Bank (Space Bank)	Mambu	Cloud Banking Platform (Retail Core migration)
Tide	Mambu	Cloud Banking Platform (SME Core greenfield)
Timo	Mambu	Cloud Banking Platform (Retail Core migration)
TNEX (MSB digital spinoff)	Mambu	Cloud Banking Platform (Retail Core greenfield)
TymeBank	Mambu	Cloud Banking Platform (Retail Core migration)
Tyro	Mambu	Cloud Banking Platform (Business Banking Core greenfield)
ZestMoney	Mambu	Cloud Banking Platform (Retail Core greenfield)
Wenance	Mambu	Cloud Banking Platform (Retail Core greenfield)

Source: Company press releases & website

BofA GLOBAL RESEARCH

Thought Machine – focused on developing a core banking software application

Thought Machine is a cloud-native core banking technology firm. IT was founded in 2014 by a team of former Google engineers with the specific purpose of enabling banks to modernise their operations and move away from legacy IT platforms. As a result, the company operates under a drastically different business model vs. legacy providers and Mambu: instead of attempting to provide a comprehensive banking platform, the company is focused on solely developing a core banking software application that is highly tailorable.

"Vault" core banking software – hyper tailoring

At the very start of the engagement, a bank gets its own Vault core banking instance. This allows the financial institution to instantly start creating its own bank, by adding apps, connecting other systems, building products and so on. This is a cornerstone of how Thought Machine builds banks – by having a working bank at project inception the bank can get an in-depth feel of how everything works and be able to build the bank in a truly agile fashion.

Vault is highly configurable, enabling banks to build exactly the proposition they want. Banks can write Smart Contracts and workflows themselves through Vault's developer SDK (software development kit) – this enables the client to design banking products at code-level using Python. Thought Machine also has a strong network of partners who can write the smart contracts, workflows and other configuration content. This is similar to Mambu's strategy to take advantage of the disintermediation of banking software services, but instead of simply "plugging" the API to the standardised platform, Thought Machine's partners work to seamlessly integrate the capability with the highly tailored Vault core.

Thought Machine & JPMorgan: a new beginning for T1/2 banks' migration or a precursor to exclusivity?

In September 2021, JPMorgan hired Thought Machine to engineer the core banking system of its new retail banking division in the UK. This was the first instance of a Tier 1 bank calling on a cloud-native neo-provider – these banks do not typically outsource core banking software design and have traditionally only relied on incumbent providers for a select set of highly tailored services.

Although this has not triggered a wave of mass demand from other similar financial institutions for services from neo-providers, it has nonetheless triggered a shift in thinking for Tier 1 banks who now recognise the significance of replacing legacy banking systems with cloud-based solutions, a field where neo-providers are better equipped than traditional providers.

While we expect this migration from some Tier 1 and 2 banks to those next-gen systems will take some time, we do believe that once the first bank successfully implements a large, "at-scale" next-gen core system, the floodgates of demand will open – and we believe the JPM/Thought Machine contract could act as such. However, others believe that such partnerships are simply a precursor to M&A activity. JP Morgan is already one of the main investors in Thought Machine and it is plausible that the company would prefer exclusivity over the technological stack on which it will run its UK retail operations.

Exhibit 44: Thought Machine main disclosed customers with specific product usage

Thought Machine's flagship core banking software Vault is increasingly popular following some big contracts with Tier 1 banks

Customer	Vendor	Product
Atombank	Thought Machine	Vault - Core Banking engine
Curve	Thought Machine	Vault - Core Banking engine
Lloyds Banking Group	Thought Machine	Vault - Core Banking engine
Monese	Thought Machine	Vault - Core Banking engine
SEB	Thought Machine	Vault - Core Banking engine
Standard Chartered	Thought Machine	Vault - Core Banking engine

Exhibit 44: Thought Machine main disclosed customers with specific product usage
Thought Machine's flagship core banking software Vault is increasingly popular following some big contracts with Tier 1 banks

Customer	Vendor	Product
TransferGo	Thought Machine	Vault - Core Banking engine
Arvest	Thought Machine	Vault - Core Banking engine
ING	Thought Machine	Vault - Core Banking engine
JPM Chase	Thought Machine	Vault - Core Banking engine
Al Rajhi Bank	Thought Machine	Vault - Core Banking engine
Arvest	Thought Machine	Vault - Core Banking engine
Impact Credit Solutions	Thought Machine	Vault - Core Banking engine
Intesa Sanpaolo	Thought Machine	Vault - Core Banking engine
Lunar	Thought Machine	Vault - Core Banking engine
Mascoma Bank	Thought Machine	Vault - Core Banking engine
Magyar Bank Holding	Thought Machine	Vault - Core Banking engine

Source: Company press releases & website

BofA GLOBAL RESEARCH

10x – flagship product SuperCore built on cloud-native technology

Built on cloud-native technology, 10x's flagship product SuperCore is delivered as Software-as-a-Service, and is globally available. The solution is designed to simplify deployment, integration, infrastructure and technology operations, all whilst lowering the associated costs. A set of fundamental components for financial products can be continuously configured and extended to meet customers' current and future requirements, without the need for re-build. Around the SuperCore, SmartAdapters, APIs and SDKs also allow seamless integration to back office, channels and third-party applications and services.

Banking software & differentiation strategy

While Thought Machine can benefit from the technological insights of its ex-Google engineers, 10x was founded by banking professionals and its business model is reflective of that: its SuperCore product is designed for clients to be able to develop financial product intuitively and directly, with a "click-not-code" approach that allows financial product managers, as opposed to software developers, to design the platform and products for the financial institution.

Although we believe there is merit to the idea and expect solid growth for the start-up, we also anticipate strong competition from Thought Machine specifically. Comparatively, the 10x technological stack cannot match the capabilities of Thought Machine's and we believe this is reflected in the success of the former in securing contracts with a number of Tier 1 banks. Similarly to Thought Machine, though, we do believe that the company will need to present the market with a successful proof of concept to legitimise its status as a viable alternative to traditional banking software providers.

Exhibit 45: 10x main disclosed customers with specific product usage
10x has secured three clients, which are international and significant in size

Customer	Vendor	Product
Nationwide	10x	SuperCore
Westpac	10x	SuperCore
Chase	10x	SuperCore

Source: BofA Global Research estimates, company press releases & website

BofA GLOBAL RESEARCH

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