THE INNOVATION GAME: ESCAPING LEGACY WITH NEW TECHNOLOGY

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01
FOREWORD

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The challenge that lies at the heart of banks' efforts to innovate can be encapsulated in a single word – speed. Consumers are witnessing an ever-increasing rate of innovation from new, digitally-enabled providers but they are not witnessing the same agility in service or product development from their banks. Customer expectations have also been set to a higher bar by Fintechs and large technology companies.

Legacy core banking systems at the heart of banks' IT infrastructure are generally identified as one of the causes, holding back banks' innovation efforts and crippling their agility. Often it is not the systems themselves to blame. They have performed reliably for many years but they have become increasingly complex and it's getting harder to find talent that can support them. Innovation is happening much faster from the outside-in and less on core banking systems. These systems are systems of record and can only change at a rate which is much slower than current innovation around the customer or customer engagement.

Meanwhile the world outside the bank has become digital. Computing power and data have become near-infinite and the development of artificial intelligence, cloud computing and machine learning is accelerating.

The successful companies of today, from Apple to Google to Microsoft, have created cloud-based, open, digital ecosystems to interact with their clients and jointly develop new services. In contrast, large banks have operated with huge internal IT departments and closed systems run by legacy technology.

Changing this approach will be both a technical and cultural challenge for banks. It is encouraging that many have opened innovation labs and are actively engaging with new Fintechs and software companies. For example, Barclays has six innovation centres and has invited more than 150 companies to rent space and jointly innovate with them.

Banks also need to think more about their customers' journey and apply technology that can help. This means looking at technology through new filters. Core systems, while slow, are still vitally important to daily operations so banks are understandably reticent to make any radical changes to them. However, banks can differentiate themselves via their front and middle office systems that may be better suited to new operating models.

The use of APIs and cloud platforms will be crucial in changing the way banks develop new systems and bring innovation into the institution. Non-core applications and the data within them can be hosted in the cloud, relieving the pressure on internal systems. Meanwhile, standardised and tested APIs can be used to link core systems to the outside world and a new generation of developers.

At Finastra we have developed FusionFabric.cloud, a Platform-as-a-Service offering designed to help banks adopt this new operating model where they can open themselves up to the outside world and the developers of the future. These people can be data scientists, business analysts, or millennials with different skill sets to the traditional internal bank department. They are demanding new user interfaces and transactions that can be completed in five clicks, not fifty. These are the new digital service standards that banks must meet.

It will take time for banks to fully adapt to these operational and business changes – to feel comfortable with putting core systems in the cloud, to recruit new personnel and, all the while, to maintain compliance with new and existing regulations, from MiFID II to PSD2.

However, the growing sophistication of off-the-shelf technology and the benefits of the platform concept have made innovation easier than ever before at a time when it has never been more necessary.

02

INTRODUCTION: THE IMPACT OF CLOUD PLATFORMS, APIS AND LOW CODE DEVELOPER TOOLS ON BANKS' INNOVATION EFFORTS

Banks are well aware of their need to innovate. In countless other sectors, services are digitally delivered by companies built on digital ecosystems. Even within banking, new entrants have been built from scratch with new technology to deliver the same digital services.

Financial organisations are even being pushed by their regulators to be more innovative. The Payment Services Directive 2 (PSD2) and its concept of open banking forces banks to make their customer data accessible to third parties, including both rival banks and new non-bank competitors able to offer new banking products and payment services to these consumers.

In contrast, many banks seem to be still stuck in an analogue world, tethered to their core banking systems which are invariably outdated legacy products, wrapped in layers of middleware and are incompatible with new digital technology.

In addition, there are large internal IT departments which were historically charged with creating one off systems for their banks but have increasingly found themselves extended just to keep the bank running.

By virtue of their heritage and their established status as reliable institutions to be trusted with their customers' financial assets, banks have so far been able to maintain their position. But for how long? New digital-only banks built on lean and clean infrastructures are growing in number and market share. And the introduction of open banking may erode incumbent banks' standing yet further.

However, it may also help encourage banks to double down on their innovation efforts. Success may be determined as much by the approach they adopt as the technologies they deploy.

The most successful companies of the digital age have been built on open ecosystems, where third parties, developers – even consumers – are encouraged to add their own applications, products and services, that can be available to all, adding value and extending the core proposition. In contrast, banks have been built on closed, internalised systems, that are tightly guarded from external threats and closed to third parties.

While the challenges of transformation involve ever more stringent data protection strategies and the risks of live migration loom large, emerging new technologies such as cloud platforms, open application interfaces (APIs) and low code developer tools are now converging to present banks with an opportunity to escape the stranglehold of their legacy systems, to enable more external collaboration and to unlock the potential for new, innovative customer services.

Change is instigated and orchestrated by the culture of any organisation. To what extent does this present more of a challenge for financial institutions?

Through a series of extensive interviews with leading IT strategists and directors, CIOs and CTOs, this report will examine how banks are addressing all of the challenges outlined above. These include:

– Resolving the conflict between maintaining their core banking systems and encouraging more innovation;
– The technology strategies used to address innovation (from APIs to low code and the cloud);
– The barriers that need to be overcome, and
– The implications for the future of banks' technology functions and the people that work within them.

03
AN UNWELCOME LEGACY

The problem of so-called legacy systems is not new to banks but it has possibly never been a greater issue than it is now.

Banks are under increasing pressure to adapt to a digital age and pursue a more innovative approach to product development, especially in the retail and transaction banking market where the business model for payment services is being reinvented.

We are living in a digital age where commerce, communication and all manner of consumer services are delivered digitally. There are a few exceptions, such as banking, where some of the largest banks have yet to leap fully into the digital age, largely because they are tethered to age-old core banking and payment systems that are critical to their operations but largely incompatible with digital services and new generations of applications.

This situation has created an unhelpful tension between the IT and business divisions within a bank, says Hans Tesselaar, executive director, Banking Industry Architecture Network (BIAN), a Frankfurt-based non-profit that brings together banks, technology providers and consultants.

"The business typically wants to innovate while IT is focused on maintaining business as usual and keeping the lights on," he says.

At the heart of this tension lie the legacy systems that bank infrastructures are built upon. "Developing more innovation generally means replacing these legacy systems. This is a huge investment and a process that resembles open heart surgery," says Tesselaar.

Banks are understandably reluctant to address legacy system replacement given that the consequences can be catastrophic if the project fails in any way. The path to digital transformation is littered with the fallout from failed legacy system replacements.
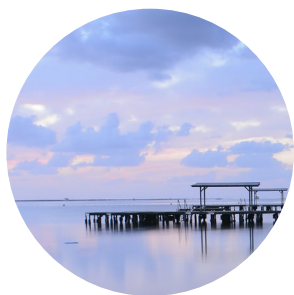
Given banks' aversion to radical structural change, Tesselaar says that for banks to pursue innovation, they need strong leadership that will ensure changes actually occur and are fully followed through. "You also need someone that sees the benefits of innovation, rather than the costs. It is actually costlier to stay where you are and not make any changes," Tesselaar adds.

"You can shine up your legacy system and try to make it look more modern with new coding wrapped around it, but that will only last for so long. Nor can you make too many drastic changes at once. You need to migrate in an extremely controlled way and you need a road map," says Tesselaar. Banks need to assess their current IT landscape and decide what to keep, what to replace, and how, all of which requires a lot of insight and planning, he says.

"We consider the idea of keeping any legacy systems for the long term as one to keep away from. If you find a way to keep your legacy system up and running, that's a compromise. During the next decade I expect to see a mix of legacy and agile technology prevail as banks continue their migration strategies. For this intermediate period, banks will be looking to wrap their legacy systems and move via an enterprise service business to new modular technologies."

There is a reason that banks have kept their legacy systems for so long. They have been hugely reliable and effective for decades. Consequently, many bank executives believe that it is not the legacy systems that are the problem but the technology and tools that have been built around them over the years.

"There are some legacy systems that cannot cope with new technology but in most banks, the core payment processing system works quite well, even if it is difficult to replace," says Ad van der Poel, Head of Core Cash Management, Global Transaction Services (GTS), EMEA, Bank of America Merrill Lynch.

"The problem is that the technology, software and systems that have built up over many years are all quite different." This creates problems when trying to adopt new technology, and lies at the heart of the tension between advocates for innovation and the guardians of the bank's stability.

04

TRANSFORMERS IN DISGUISE – KEY CONSIDERATIONS OF DIGITAL OVERHAUL

This tension has become more acute when banks have attempted to pursue digital strategies, where the technology moves from a supporting role to being integral to their strategy. It is something with which non-technology companies have always struggled, says Thomas Nielsen, Chief Digital Officer at Deutsche Bank, who was appointed in September 2017 after previously serving as Chief Digital Officer at the large UK retailer, Tesco.

The challenge is further complicated by the lack of consensus on what 'digital' actually means, says Nielsen. A 'digital strategy' means different things to different people – more innovation, better user experience or operational cost-cutting. The lack of definition stems from the bifurcated view of technology itself within the banking world, says Nielsen.

"There are two ways of looking at technology. You can look at it as a necessary evil and hire a CIO to keep costs down. Or you can see it as a strategic differentiator and hire a CTO or CDO to drive fundamental changes in the way technology is being developed and deployed."

Similarly, there are two ways of implementing a digital strategy; incremental changes can be adopted system by system and process by process, slowly bringing the people along with you. Or banks can do it wholesale, undergoing radical change. Additionally, it can be done from within, or a separate entity can do the more radical change. Both approaches work but operate at vastly different levels of velocity and disruption.

While the big tech companies of today – Google, Amazon and Facebook – have been unencumbered by legacy infrastructure and able to embrace digital change, the big banks of today are still very much legacy-run, making any radical change that much more challenging, Nielsen says.

Nielsen describes the conflict between legacy and digital technology as akin to driving an old gasoline powered car – but wanting all the attributes of a shiny new electric car. "You love the car, it's been running for a long time and it has got you to work every day. Heck – you built it. You probably even named it. But what you really want is a Tesla – and you don't get a Tesla by putting 2,000 AA batteries in your 20-year-old gasoline powered car."

The biggest challenge for banks and non-technology companies is their mindset, says Nielsen. "There often is a more conservative attitude in banking but they need to think beyond the normal way of doing things to achieve any radical change."

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05
NAVIGATING THE SPEED VERSUS SAFETY CHALLENGE

Speed to market is vital when adopting new technology or releasing new, innovative services. This puts incumbent banks at a disadvantage to newer challenger banks because they have existing products to support whereas start-ups have a clean slate, says Craig Ramsay, Head of Innovation for Global Liquidity and Cash Management at HSBC. "There is a migration process from existing legacy products and systems to the new ones and it is often underestimated how long that process takes."

For example, HSBC has had early success in a number of distributed ledger technology (DLT) projects but it is not clear when there will be significant volumes going through such services. Speed of adoption is a critical factor often forgotten in the more excitable fintech conversations.

Another challenge is the overhead cost to banking products, says Ramsay. "There is an annual technical cost to maintaining systems and these generally increase over time while the revenue earned from these products goes in the opposite direction. It might seem natural to address this by increasing volume but that, in turn, would put more strain on the technology. This argues in favour of adopting new technology as quickly as possible."

One contributing factor to the increased cost has been the level of adaptation required by regulatory change. "The industry is about to enter a period where some of the money previously spent on regulation and compliance can now be invested into new products and services."

For newer banks such as Tinkoff, the Russia-based branchless bank, it is easier to adopt a digital strategy because they are unencumbered by legacy. "Generally, the best way to fight expensive legacy system upgrades is by ensuring you don't produce them in the first place, especially in such core areas of banking as ATMs and CRM," says Vyacheslav Tsyganov, Chief Information Officer at Tinkoff Bank.

He describes Tinkoff as, "essentially a tech company with a banking licence," where more than 60% of the staff at its headquarters are IT professionals.

Consequently, it is able to allocate more of its IT budget towards new products and new systems development, says Tsyganov.

"Certainly, like at other organisations, we compete internally for resources, so technology needs are carefully weighed against business goals. However, there is never a question of whether to innovate at Tinkoff. It's rather a question of which new products should we concentrate on to ensure the greatest contribution to our bottom line going forward," Tsyganov adds.

However, the rapid pace of new technology development means that the speed with which existing systems age is accelerating, meaning that even the newest banks cannot afford to be complacent about the prospect of any element of their IT infrastructure adopting an unwanted legacy status.

"By investing in support and maintenance of legacy systems, organisations leave themselves less room to innovate, the ultimate cost of which is becoming less competitive or even being forced out of business," says Tsyganov. "We believe that to prevent rapid aging of systems and practices, all development teams should allocate resources to regular code refactoring."

Replacing legacy systems is clearly a massive potential risk, and there have been some very public IT meltdowns as a result of migrating old core banking systems to new platforms.

SOCIAL MEDIA MAGNIFICATION

In the age of social media, these moves are made all the more painfully public for the banks concerned.

As Simon Eacott, Head of Innovation and Business Development, Payments, NatWest says, "We need to maintain business as usual for our 20 million customers. Every day we have to be online and running smoothly, so any change that goes into the legacy system must be carefully managed."

That said, banks need to continue to innovate and to build new customer propositions, says Eacott. "The biggest challenge is taking some of these proof-of-concepts and pilots from the sandbox into full production. We protect our production environment very carefully so getting from idea into production, in a safe but timely way, is our biggest challenge."

As banks turn to focus on innovation, there will still be compromises to make. For example, at what point do you stop the provision of incremental services on existing products and migrate to new offerings? Banks will have to manage their customers' expectations carefully in terms of what services will be available in the future, says HSBC's Ramsay.

Global banks will also want to be selective about what new technologies are applied on a global basis, says Ramsay. "The focus needs to be on solving customer requirements. In doing so, we can then apply the appropriate technologies. New technology cannot be a solution looking for a problem."

One area where banks such as HSBC are not willing to compromise is on the security of, and confidence in, the robustness of the underlying technology. "We cannot afford to introduce risk for our customers or ourselves. We have been around for 150 years and we plan to be servicing our customers over the next 150 years. We want our customers to be able to trust us.

Hindsight is a wonderful thing. The banking industry would not want new technology to be the cause of a future crisis. "In five years' time, we don't want anyone to say the industry went too fast in deploying these new technologies," says Ramsay. "From an HSBC perspective, everything has to go through robust testing and risk evaluation process."

One approach to mitigating such risks is avoiding 'big bang, behemoth projects' and adopt an evolutionary approach to change. "We make changes incrementally, breaking the overall project into smaller digestible parts and changing those step by step," says Tinkoff's Tsyganov.

> "Instead of having an army of internal developers, you could have individual, external developers focused on specific areas of expertise connecting to our infrastructure from beyond our firewalls using APIs. It is a credible way to connect our services to service providers in other industries such as health, transport and retail. It has so many benefits."
> **PAULA DA SILVA, HEAD OF TRANSACTION SERVICES, SEB**
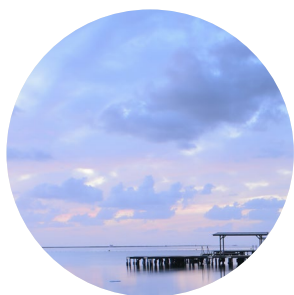
Other banks are taking a modular approach, such as BAML. "This means you are simply replacing individual apps, platforms or systems with newer versions," says van der Poel. "But if you have all of that technology tied up in one system, it can be a challenging task to replace them."

In recent years, software firms have developed and promoted a 'Platform-as-a-Service' approach to IT development whereby APIs are used to open up a bank's core system to other internal and external developers in order to encourage more innovation.

Van der Poel says that BAML's modular approach is similar. However, the bank is moving away from both a pure self-build approach, or a transactional vendor relationship, where external products are purchased and added to its core system. Instead it favours a deeper vendor partnership using the vendor's existing platforms.

"There are two parts to this approach – when we are close to the core system, we like to retain control but when you get further away, we are happy to leverage the expertise of a vendor. Typically, vendors work with a lot of other banks and there is much that we could learn. We should not pretend that we know everything."

"There is an annual technical cost to maintaining systems and these generally increase over time while the revenue earned from these products goes in the opposite direction. It might seem natural to address this by increasing volume but that, in turn, would put more strain on the technology. This argues in favour of adopting new technology as quickly as possible."
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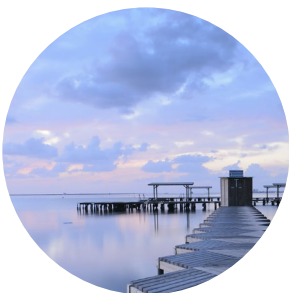
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USING CLOUD PLATFORMS, LOW CODE AND APIS TO STAGE TRANSFORMATION

The trend toward 'platformification' is considered an increasingly viable way to address the limitations of legacy infrastructure through the use of a platform-based strategy, where APIs and cloud-based systems and services are used to build new applications and tools on the outside of the legacy systems.

"This could be the best thing to happen in banking in a very long time," says Paula Da Silva, Head of Transaction Services, at Swedish bank SEB.

All banks face pressure to maintain their legacy systems in the midst of a digital age and Da Silva believes that APIs could be an effective solution to this ongoing problem. "Legacy systems are cheap to run but they are not high performers in this new digital space, so it is important to keep them 'dumb' and then be smart elsewhere in your infrastructure. It could be a match made in heaven and I am in favour of adopting this approach right now. We could do much more, much quicker."

This approach is also a potential solution to increased customer demands for innovation, the eternal need for cost control and the utilisation of new technology, says Da Silva. "Instead of having an army of internal developers, you could have individual, external developers focused on specific areas of expertise connecting to our infrastructure from beyond our firewalls using APIs. It is a credible way to connect our services to service providers in other industries such as health, transport and retail. It has so many benefits."

But there are also operational risks that come with working with third parties and external developers so you need to have governance around such a strategy, says Da Silva. "We are currently in a transition period from the old legacy-based approach to an API-based strategy. There are various decisions for banks to consider about the extent to which they open up their infrastructure to outside parties and whether they use private APIs or open APIs.

"We have seen other industries using APIs for a long time. It will be important to ensure service quality because it is not the API developer that is directly exposed to the customer. If the APIs do not work or are slow, it is the bank not the third party developer that will catch the enraged frustration of consumers. There is a significant downstream risk. That governance is an important first step."

IN THE CLOUDS

Three new technologies feature prominently in banks' plans – cloud-based platforms, APIs and low code/no-code development tools. Banks are especially positive towards the cloud.

Some, such as Tinkoff, are completely cloud-based. Others are increasing their use of the cloud. "Our attitude to the cloud has changed in the last two to three years from 'no' to 'go', albeit with some conditions," says SEB's Da Silva. "We are currently trying to mitigate and manage the risks associated with the cloud. But we are prepared to consider the cloud wherever we see benefits and for any system, from CRM to trade finance."

Others see the cloud as one of the most promising but daunting opportunities for banks. While there has been an explosion in public cloud services from the likes of Amazon Web Services, Google and Microsoft, there are also lots of misconceptions about security, data privacy and regulations concerning the public cloud, says Deutsche Bank's Nielsen.

"As a global bank I would much rather have a third party managing non-core utilities, like compute power and storage," says Nielsen. "Setting up servers is not a core competency for a bank, I would argue. I would also argue that it is possible to secure systems in the public cloud as well as on-premise deployments."

> "Certainly, like at other organisations, we compete internally for resources, so technology needs are carefully weighed against business goals. However, there is never a question of whether to innovate at Tinkoff. It's rather a question of which new products should we concentrate on to ensure the greatest contribution to our bottom line going forward,"
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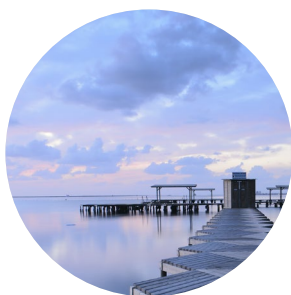
BIAN's Tesselaar foresees the majority of banks moving to a private cloud in the near future because it creates a huge cost saving in hardware and reduces concerns over security. Over time, as the technology matures and banks become more comfortable with the concept, they can adopt a more cost-effective hybrid approach where the non-core data can be stored in a public cloud, says Tesselaar. "It gives them a huge cost saving and cheaper hardware."

The use of the cloud will also be essential for banks looking to adopt a more agile environment for software development, given that the existing infrastructure at many banks makes it difficult to compete with new entrants. As HSBC's Ramsay says, "Successful teams can develop a hybrid approach where you are agile within your existing architecture and, at HSBC, we are working with the business and technology teams to achieve this."

The use of the cloud is increasing at HSBC. In March 2017, the bank announced it is investigating how it can use Google's Cloud platform to store data in a private cloud. "The world is becoming digital and data is growing exponentially, so banks will benefit from the flexibility the cloud gives to store and manipulate the data, as well as the ability to access it and organise it in a standardised way."

The bank will then be able to apply machine learning and AI to create valuable insights for clients. It will also be a much more prolific user of APIs in order to achieve the move to cloud platforms. "The migration from existing infrastructure into a cloud environment should not be underestimated and the use of APIs will be integral for banks," says Ramsay.

DON'T WORRY, BE API
According to Ramsay, APIs are discussed in two different ways within HSBC. Firstly, there are the internal APIs, which extract information from core systems and deploy it in the cloud where it can be exposed to AI, ML and other new technologies.

Then there are APIs exposed to the external environment, used by external developers which connect to the bank. These will have a consistent security layer and will not be directly connected to the bank's core systems but will instead connect via a mid-office layer.

Standard Chartered Bank is taking a similar approach to its use of APIs, using them to promote the bank and its services to the outside world and using them internally to link its own systems, says Michael Gorriz, Group Chief Information Officer, Standard Chartered Bank.

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Of the APIs that are publicly available, the vast majority are for elected users, says Gorriz. The APIs create access to information for the intended users. Corporate customers are able to check their account status and balance, and perform simple transactions using an API. The APIs are also used to serve institutional customers, and for selling third party services such as insurance.

"The technology behind APIs has been around for more than ten years and is not their most important property," says Gorriz. "The more interesting part is how the APIs have become part of a new business model."

It is a model that lends itself more to innovation and is able to generate new ideas without having to channel everything through the many layers of the bank's internal technical teams. "You can build a design thinking team created by business users, clients and technology people. Once that has been agreed, then you can bring in technical people," says Gorriz.

In March 2016, Standard Chartered set up a lab environment and accelerator in Singapore and Mumbai, says Gorriz. Corporate customers were invited to put forward their demands for trade finance and cash management services and a new operating model was designed accordingly.

Within six months the bank had conducted its first pilot and then in September 2017 it onboarded its first corporate client. It has since taken the same approach to its custody service and retail banking, culminating in the creation of a digital bank in Africa, which it hopes to roll out in 2019.

"Banks have typically operated in a more traditional way," says Gorriz. "You come up with a big plan and then put it all through compliance but then find out the reality is completely different. With this [API-based] model, you can look at the most important things, what works well, what doesn't. It is agile mode, fast learning and you can show success in just a couple of months."

Greater use of APIs is also fostering clearer thinking, says Gorriz. "In the past, people were looking at processes, now it's about services based on other people's processes. Business and technology start to talk the same language, and it makes innovation and development of new services much easier."

However, there is still progress to be made on the standardisation of APIs, a problem that has existed in other areas of the banking industry and one that is responsible for many of the manual processes that still persist. The difficulty in creating standards is the sheer size of the market. As Gorriz says, to have even the top 50 banks all using the same standard would be a big task.

Consequently, Standard Chartered Bank insists on standards wherever possible. Any external or internal APIs are examined to ensure they meets the bank's own standards. "We look at external and internal services the same way," he says. The bank recently installed an API gateway with one set of standards around access control and other issues such as security that is based on the JSON language and publicly available. "We are getting there," says Gorriz.

Standards notwithstanding, Gorriz expects to see much more product development using APIs and more integration between banks and external developers, be they corporate customers or individual entrepreneurs looking to design new payment apps. Banks are also employing the use of sandboxes to help speed up the innovation process and insulate the bank's core systems from any operational risk.

It is an approach that has helped Standard Chartered transform its development process, says Gorriz. Proof of concepts are devised in two to three weeks using anonymised data and, if the results are positive, the project can go through the full compliance process.

LOW CODE VERSUS NO CODE
The final components in the digital transformation 'suite' are the low code/no code development tools that drastically reduce the coding required to develop new software. These tools are especially applicable to a new cloud-based environment, where data sits in the cloud rather than in the bank's own apps, databases or servers, says HSBC's Ramsay. "Now our data sits in the cloud, we will need new tools."

"The smaller the asset being created, the lower the cost to deliver and publish must be. Low code could become a method to allow people without a high degree of technical knowledge to access data easily to create new products and services within a controlled environment."

Deutsche Bank's Nielsen also expects to see a growth in the low code/no code market. "Today you have to hire data scientists and software developers to gain meaningful use of the large data-sets that exist in banks. No code goes a stage further."

> "Do banks have the right attitude to adopt a design thinking culture? Banks have to become aware that there are better ways to connect with customers and they don't need to provide all of the services themselves. They have to accept that there are third parties out there that can do a better job of providing certain services."
>
> HANS TESSELAAR, EXECUTIVE DIRECTOR, BANKING INDUSTRY ARCHITECTURE NETWORK (BIAN)

Artificial intelligence, machine learning and related technologies will become more readily available and easy to use, says Nielsen. "It is a Lego-like approach and I think the implications will be massive. In the short-term it will require a re-education of the user base, but with the right systems and training users will be able to customise all of this technology and create their own solutions."

At Tinkoff, CIO Tsyganov says it is important to make the distinction between low code and no code, where the former is designed to streamline the development process for professional developers and the latter refers to so-called citizen developers or business users that do not have to write a single line of traditional code.

The argument is that low code can still produce enterprise-class applications but in a reduced timescale, whereas no code makes software development more accessible to business users but produces applications of limited use.

"I believe in the 'low code' approach since 'no code' essentially means that you will have a lock-in on basic technology with all of its limitations," says Tsyganov. "The 'no code' approach should only be used in some minimal product testing phase, but not when its full functionality is required.

"Low code gives you the ability to optimise. For example, front end teams can easily re-use elements from our user interface kit, a front-end library containing design guidelines and JavaScript code for different frameworks, so they don't need to reinvent the wheel."

In the future, improvements in machine learning may change the way code is written and make the 'no code' approach more desirable, says Tsyganov. He also believes that neural networks and deep learning techniques will be the basis of Software 2.0 – the next generation of software development.

"Instead of giving instructions to a computer written in programming languages, such as Python or Java, people will be able to prepare domain-specific data and then feed it into learning algorithms that are iteratively trained and continuously improved."

07
CULTURE CHANGE LEADS THE WAY

As important as the technology is, Gorriz is another of the bank executives who believes that the technology is secondary to the cultural and business model changes it can facilitate. "The transformation of business models and culture is more important than the technology. We have got a lot of interest in the cloud, agile and devops. We are gravitating to those models and services but we have to take the business with us on this journey."

One example of a new business model is one where banks work more closely with third parties, be they vendors or fintechs, via the use of APIs – creating the kind of digital ecosystem employed by the likes of Google, Apple and Facebook. BIAN's Tesselaar describes it as a design thinking culture and says that any barrier to adopting such an approach is likely to be more mental than technical.

"Do banks have the right attitude to adopt a design thinking culture? Banks have to become aware that there are better ways to connect with customers and they don't need to provide all of the services themselves. They have to accept that there are third parties out there that can do a better job of providing certain services."

The introduction of the Payment Services Directive 2 (PSD2) and the open banking concept is expected to be a major driver in the use of APIs and the adoption of a design thinking model, however Tesselaar says this effect could be limited due to a lack of awareness among consumers, concerns over data privacy and uncertainty as to quality of the services so far produced.

"We are still in the closed banking environment we are used to but open banking will come and will generate more competition but I am not sure if it is meeting the needs of new fintechs more than it is meeting the needs of consumers."

Open banking has raised fears about the potential for fintechs to encroach further on banks' territory. But most bank technologists are more enthused about the benefits of collaboration than the threats of competition. "APIs are the way fintechs and partners can connect and collaborate," says Deutsche Bank's Nielsen. "It might mean some products compete with our own but they will also enhance our offerings in other areas. It is a fantastic opportunity and we are very passionate about this."

The use of APIs as mandated by PSD2 also means that banks are losing an element of control in how they run their operations and develop their systems but this has forced them to be more like other technology companies, says Nielsen.

"We recognise that we have to allow customers to do more and develop more of their own tools and services. Banks have to be more open and transparent with our systems and infrastructure. We have to become an open platform but it is a painful process."

Although PSD2 was introduced this year, it will not be officially enacted until early 2019 and it is only then that we will start to see more open banking projects, says SEB's Da Silva. The bank is willing to work with both individual developers as well as start-ups, says Da Silva.

"We have a venture capital arm that invests in start-ups and we also run hackathons to attract individual developers around areas such as robotics or AI. I think in the future we will complement our current offering by utilising a mix of the two."

> **"Agile only works when you have liberated thinkers who are able to think differently. And it is always ultimately the people that make one bank different from another."**
> **AD VAN DER POEL, HEAD OF CORE CASH MANAGEMENT, GLOBAL TRANSACTION SERVICES (GTS), EMEA, BANK OF AMERICA MERRILL LYNCH**

08
THE HUMAN ELEMENT AND NOT THE TECHNOLOGY WILL POSE THE BIGGEST CHALLENGE

A development model based on cloud platforms, APIs and low code tools will clearly enable banks to indulge in more innovation without necessarily having to sacrifice their legacy systems – at least not in one sudden removal. Instead they can use APIs to build new tools on the outside of their existing infrastructure.

As such, it is a model that is welcomed by most banks, as evidenced by SEB's Da Silva's comment that it: "Could be the best thing to happen in banking for a very long time."

However, all banks realise that there will be some practical considerations in terms of the transition from legacy to digital. A lack of standards for open APIs needs to be considered, as does security, so few banks are willing to put speed of development before security. As Craig Ramsay, HSBC says, "We might not always be first but we will always be safe."

There are also regulatory considerations around the use of AI and ML that must be monitored, particularly as data privacy is now more of an issue with both GDPR and the Cambridge Analytica scandal.

It is a challenge that is recognised by newer banks as well. "The biggest barrier is a change in mindset about how banking is carried out," says Tinkoff's Tsyganov. Such a mental shift is necessary within an organisation to enable innovation. This means banks of the future or innovative banks must have a flatter structure, less bureaucracy, and clear established standards for how partners can plug into their network, while staying compliant with legal requirements and ensuring security isn't compromised.

A platform would need to establish 'plug-and-play' standards enabling developers to build innovative products and services for consumers, says Tsyganov. The platform infrastructure would manage the secure exchange of data, oversee authentication and authorisation, and ensure compliance with relevant regulations.

"**Banks have to look at how they upskill the existing workforce and encourage them to sit easily within this new environment. You have to cater for more creative and non-traditional people (i.e. non-banking) and that will be a big challenge for banks. Those people will often look, talk and think differently,**"
THOMAS NIELSEN, CHIEF DIGITAL OFFICER AT DEUTSCHE BANK

"The most challenging aspect of moving traditional banks to a platform-based approach or ecosystem will be in managing the organisational change involved, which is an integrated effort that covers everything from strategy and governance to customer experience management."

The human and cultural issues involved in innovation and the use of new technology and techniques are a commonly held concern among the bankers. "There are technical, legal, commercial and cultural barriers," says NatWest's Eacott.

"We also have to understand the risk and liability involved. So we need to find the balance between pushing the boundaries of innovation but maintaining safety and security for the customer. The legal issues can be solved and you can keep up with the technology but overcoming the cultural barriers and changing the way we operate can be a big challenge."

The final challenge for banks will be human resources and recruiting staff able to work in a new environment, says Deutsche Bank's Nielsen. "Banks have to look at how they upskill the existing workforce and encourage them to sit easily within this new environment. You have to cater for more creative and non-traditional people (i.e. non-banking) and that will be a big challenge for banks. Those people will often look, talk and think differently."

It is a sentiment shared by BAML's van der Poel. "Agile only works when you have liberated thinkers who are able to think differently. And it is always ultimately the people that make one bank different from another."

Working with young individual developers will be a cultural change for many banks. "We can talk to a 20-year-old who can go onto any interface and fix it using simple web tools that are available," says SEB's Da Silva. "They have a totally different mindset to the dedicated banking and financial professionals. It seems easier to teach these guys about the banking industry rather than the other way round.

"For example, a 25-year-old ex-Google developer may be more attuned to a modern consumer rather than a corporate market. There is a more specialised knowledge required for the corporate market. But we are now seeing online treasury services developed by fintechs. I think this area will evolve massively over the coming years."

Should this area evolve as expected, technology and legacy systems may be the least of banks' worries. Instead it may be the recruitment battle they will face with other industries. "Anyone studying maths over the next five years will be incredibly valuable," says HSBC's Ramsay. "There will be a skills shortage for all of these companies that want to use AI and write algos. Technology won't be the problem."

"We also have to understand the risk and liability involved. So we need to find the balance between pushing the boundaries of innovation but maintaining safety and security for the customer. The legal issues can be solved and you can keep up with the technology but overcoming the cultural barriers and changing the way we operate can be a big challenge."
SIMON EACOTT, HEAD OF INNOVATION AND BUSINESS DEVELOPMENT, PAYMENTS, NATWEST

09
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