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Chapter 12: Exploring the future of embedded finance and hyper-personalized digital banking

12.1. Introduction

In the last decade, through a series of incremental technological advancements facilitated by APIs, companies have started to weave financial solutions into their user experiences. Spanning functionally from payments to lending, insurance to investments, embedded finance represents the unbundling of financial services from institutions into the platforms businesses use to interact with their customers. Customers can now do everything from transferring money instantaneously across the globe to taking out a life insurance policy, all without ever leaving the company's ecosystem. This is the thesis of embedded finance. By embedding financial products and services into non-financial platforms, companies simplify the lives of their customers at a time when digital interactions represent the majority of consumer engagement. Banks hooking up their services to key user-centric applications like rideshare, logistics and merchant banking, or social commerce are successfully competing without ever having to build a multi-trillion dollar consumer brand (Arun, 2025; Para et al., 2025; Revathi, 2025).

Embedded finance is an extension of the FinTech movement, prompted by the wide adoption of in-house created financial services by companies that don't consider themselves "financial". These latecomers are given tools and resources by FinTechs to launch services into the market in a risk-controlled manner, without having to invest and build the costly back-end processes and compliance infrastructure that financial producers like banks have always had to engage in. The result is a burgeoning partnership economy between banking as a service enablers and corporations that embrace the idea that financial services can and should be as frictionless and unobtrusive as the core products they exist to support. The consumer tech companies already do most of the heavy lifting, managing consumer relationships over channels like mobile, social,

and web, investing in engagement strategies designed to shine ever more brightly in an increasingly hyper-competitive digital landscape (Arun, 2025; Para et al., 2025; Revathi, 2025).

12.2. Understanding Hyper-Personalization

Hyper-Personalization is the process of using advanced technology to engage with customers and generates custom-tailored marketing messages. This enables personalized banking services, such as real-time insights about spending behavior and targeted offers to help maximize savings. Algorithms identify relevant financial offers based on user spending behavior, and by constantly analyzing user data, banks can provide relevant tips and reminders, such as warnings about overdrafts and suggestions about payment schedules to avoid extra fees. Digestible summaries about how customers spend their money and visualizations of insights are built by banks on speed dial to drive savings, and hyper-personalized offers help customers take advantage of interest-paying accounts and credit with attractive pricing. Products based on this new way of managing money could essentially create income for banks on the back end. These banks create a savings goal with the customer to make sure they have the money available when they need it, and automate that savings by moving money to a high-interest account, then sending a reminder of when it will be available, along with a request to return for completing the transaction. Ongoing guidance about all aspects of a relationship should be the basis of the banking experience and should be created by predictive modeling tools used by an experienced team of professionals. Enhanced hyper-personalized service should enable banks and their customers to share uneven losses and gains that reflect each situation over time. The relationship between banks and their clients should be that much deeper, as banks care through thick and thin about helping their customers navigate ever-changing circumstances.

12.3. The Evolution of Banking Models

In the last century, banking has evolved along five important inflection points: banking as capital intermediaries, banking as transaction engines, banking as thin margin service providers, banking as ecosystem orchestrators, and banking as experience enablement facilitators. In the beginning, banks performed the role of financial intermediaries, where they absorbed the risk of liquidity transformation. Banking originated as a relationship-driven service associated with gathering trust and incentivizing depositors to take on the risk of early withdrawal in exchange for interest payments, then lending these funds at higher interest rates to companies and individuals who needed to make investments.

With time, the need for cash lessened due to the availability of alternative currencies and liquid instruments, while the worldwide expansion of wire transaction systems made the

Fig 1: Embedded Finance Explained

payment transmission business competitive and cash flows enhanced. The resultant downward pressure on the intermediation margins created incentives for banks to process and append services to the transactions generating cash flow as a means to increase fee-based revenues and extract more value from the cash management service. Therefore, banking matured into a high-volume low-margin business as banks became large global transaction engines entirely focused on ensuring low-cost processing of standardized transactions associated with facilities like electronic fund transfers for check, debit, and wire transactions. This structural model faced severe challenges due to the emergence of telecommunications and information technology companies offering transactional capabilities that were akin to banks but with far more affordable costs. In addition, instant or same-day electronic payments had already been embraced at the consumer level in various markets, jumping over banks altogether with offerings from online consumer payment processors, customer-to-customer money transfer

applications, and consumer companies. The banks' continued push to fee-based revenues had resulted in the rise of "nonbank banks" as experienced local customer service players active in checking accounts and small business loans enabled the disintermediation of regular banks.

12.4. Key Technologies Driving Change

In addition to changing customer expectations, the foundation of embedded finance and hyper-personalized digital banking are newer technologies that allow for a new level of technology integration and support. These new technologies fundamentally change the interactions between banks and their customers, allow for more differentiated services and hyper-personalization, make it easier for fintechs and non-financial service companies to enter the financial services markets, provide new sources of data and information that create new types of embedded financial services, and make those new services easier to create and offer to customers, partners, or end users. For traditional banks, adoption of those newer technologies also allows for fundamental change to their existing operations, transforming core processes for greater efficiency or unlocking new data sources that support even greater service differentiation. While there are other important technologies that are likely to drive fundamental change in financial services, many of those are enabled by or built on the broader technology ecosystem created by artificial intelligence, blockchain, APIs, and open banking. These are the four key technologies accelerating the adoption of embedded finance and hyper-personalized digital banking. The evolution and growing mainstream acceptance of these technologies, in combination with the changing expectations of a new generation of customers, have the potential to rapidly change how financial services, and banking especially, are done forever.

12.4.1. Artificial Intelligence in Banking

Unlike in retail where hyper-personalization has been popularized by websites and apps knowing what you want before you want it, most digital banking experiences feel a few steps behind. Even if they get the demographic profile right they miss on the data-driven indicators like the frequency of transactions, transaction volume, merchants you shop from, receptiveness to different forms of communication, products you currently have, and experience you had with each product, as well as behavioral and psychometric markers like people use your service at night or on weekends. Most importantly, banks often succumb to manual student internship-like approaches to hyper-personalization – deploying a few sets of static rules for small, siloed groups of customers – instead of

taking the AI-driven, dynamic, algorithmic approach that has proven so successful in retail.

Artificial Intelligence taps into the same rich pools of data in banking. It uses advanced analytics tools like predictive analytics and big data technologies to derive hyper-relevant insights. Banks have long captured vast amounts of data but often rely on rudimentary rules to process that data to serve customers and distribute resources. AI helps banks quickly sift through huge volumes of complex, inconsistent, and fast-changing data to identify patterns that humans cannot easily detect. Although pattern detection and predictive analytics about offer, cross-sell, and upsell opportunities as well as usage optimization have been available for a long time, the incorporation of AI into banking relationships will enable banks to animate these insights into actionable personal experience delivery and conversation strategies across the customer life cycle.

12.4.2. Blockchain and Decentralized Finance

The earliest form of fintech goes back to the 1970s, based on the need for digitalizing existing processes. No city could have grown to such a massive economic core as London did without being at the forefront of processes headed for financial digitalization, strongly accelerated by the role of the City engendering a growing need for a faster-digitalized solution. Decades ago, the fintech realm consistently revolved around transactional technology, necessary to implement processes such as payments, remittances, Personal Capital Management solutions, or currency exchanges. The decentralized nature of an asset, which had generally been operated in a centralized way, demanded the introduction of something called DeFi. DeFi attempts to replicate the most frequent financial services available today and move these services onto the blockchain.

A growing number of companies are focusing on building DeFi-type tools that help democratize finances in innovative ways, from simple DeFi exchanges for different blockchain tokens to loans and lending protocols, insurance, prediction markets, and investment funds. While involving complex frameworks, DeFi seeks not to exclude customers at all, demanding no KYC procedure or proof of identity. Blockchain DeFi allows almost infinite tokenization possibilities, asset representation, and portfolio management, all executed by smart contracts, introducing an opportunity to improve the detection of lending circumstances for individuals all around the world, including emerging economies and unbanked populations.

12.4.3. APIs and Open Banking

Why is it that kludgy fintechs are replacing incumbent banks or tech-savvy retail firms are becoming banks in their own right, all with light-touch licensing? Why are banks inspired to start competing and collaborating with unlikely partners like embedded finance tech firms and super app ecosystems? In an era of rapidly changing consumer preferences, hyper-digitized lives, data-fueled decisions, and powerful super apps, APIs and open banking are key to the demand for faster, easier, and less expensive services. Open banking API infrastructures are responsible for the servitization of banking products at scale while tech-savvy companies in different industries find new ways to embed fintech products and services to lure consumers and monetize customer relationships. With the wealth of data available on consumer spending patterns and preferences, having control allows for better hyper-personalization and data-fueled services that solve engaging experiences that keep consumers coming back.

For innovators willing to experiment and deploy with a tech-savvy partner, the architecture of layer cake APIs geared to different end-user behavioral profiles is driving the evolution of different types of collaborators and competition. It answers the ubiquitous question from consumers and small businesses for banks and service providers: why don't you just package up a simple set of banking services offerings geared to my particular situations and needs? Why do I need to go to 10 different places to solve the different syncopated flows and transitions in my life? Why can't you figure out how to keep me as a loyal customer? Simple embedded finance offerings respond to the need for banks and service providers to incentivize interactions that build customer loyalty and take a cut of revenue share.

12.5. Consumer Behavior and Expectations

Digital banking is changing rapidly, driven by new technology, innovation and pandemics. Customer behavior, owning smart devices, dependence on the internet, working from home, rapid digitalization, and the changing regulatory environment brought about by COVID-19 are some of the driving forces behind digital banking transformation. Banks are being challenged to innovate and engage customers on new levels, through better products and services, new distribution models, partner ecosystems, and more empathy by thinking and reacting faster on data-driven real-time suggestions. Visible as a big opportunity, the role of trust has been proven to be a key ingredient to develop long-lasting relationships with customers.

In 2020, there was an upsurge in the usage of digital banking and telecom providers who acted quickly to prevent service disruptions, ease pain points, and provide remote support. Digital banks also had to step up and get better at delivering authentic and

customized user experiences. Social media abandonment rates have crept up, and many customers are no longer willing to invest time in interactions that don't give them what they want. Increased convenience, speed, and relevance have made consumers impatient. Businesses must provide seamless demand fulfillment and authentic customer experiences or risk losing their customers. When customers ask for assistance, they expect a frictionless experience, a knowledgeable agent, and help in real-time based on their profiles.

As customers expect personalization throughout their lives, banks have begun providing relevant products when needed. This could be a mortgage offer when a customer views property listings, or a home insurance offer when a completion date is confirmed. New capabilities are thus being delivered, often by third-party fintech firms that plug into bank systems to enhance bank services. Many banks have been engaging in live marketing, using push notifications based on predictive algorithms to offer services such as savings account upgrades when customers receive paychecks and are above target balances.

12.5.1. Shift Towards Digital Solutions

Innovations in financial technology have altered consumer behavior and changed their expectations. Ever since the pandemic accelerated the shift away from cash, it is essential to also note a shift in demand for digital banking services, the pandemic made a shift towards online retailing long overdue. Convenience and speed have largely replaced privacy and direct human relationships in terms of consumer preferences. Traditional banks are challenged not only by digital banks but also by a plethora of solutions targeting niche markets, combined with new payment forms. The technology is still low-cost and is able to be easily bundled along with other offerings. With no branches, digital banks are able to offer superior service without the burden of building ineffective markets. Business owners weary of expensive transaction fees are lured away by digital banks which offer lower rates.

With a young, affluent, and banked population eager to access quality service digitally without incurring hefty fees, Singapore emerged as a key fertile ground for digital banks. Other countries in the region still have large numbers of unbanked micro-entrepreneurs. Digital, as well as traditional banks, view embedded finance as an attractive alternative to provide services to that consumer group. There are obstacles to a seamless relationship between banks and consumer channels. Government regulations and technology asymmetries must be accounted for. Digital services allow marketplace owners to better understand who their respective audiences are thus enriching the data they use to target relevant ads. Marketplaces can funnel clients to their trusted partners and banking service providers can reward them with consumer intros and pay them for the privilege. Close

communication between the partners that aims to solve the needs of the marketplace clients will make embedders and brands successful.

12.5.2. Demand for Personalization

While the demand for personalization is not new, never before have people craved such a degree of personal attention or had such high expectations. Niche brands and challengers are demonstrating what better service looks like. The stakes are higher than ever, too; people have choices and switching is easy, and brands that fail to engage risk being relegated to the background of life. Expectation gaps underpin whole industries; retail, telecoms, and financial services are the worst offenders. The bar is high, and brands must embrace creative change along the journey to personalization via personalization at scale. That means put-best-foot-forward experiences today supported by deeper, richer insight-driven connections in the future.

The expectation gap that brands need to monitor carefully is centered on ease of interaction and intelligent personalization and is growing rapidly, both globally and across sectors. The most digitally engaged say they're actually underwhelmed by their experiences with brands they use most often. The gap is deeper among the 35 percent of the world's people who are deeply engaged with brands, using apps or websites multiple times per week to communicate, shop, browse, or engage in many other ways. Brands have plenty of room to improve: a significant number of brands get ratings of "excellent" or "very good" on satisfaction in this area. Luxury and media brands lead the way, with retailers lagging significantly. In high-involvement sectors like telecoms, financial services, and automotive, personal engagement is becoming truly sinister. More people sense they're getting done over by their providers than say they're being made to feel appreciated.

12.6. Regulatory Considerations

The myriad advantages of Embedded Finance and Hyper-Personalized Digital Banking come with incredibly complex regulatory hurdles that all the components to Embedded Finance will need to traverse. Obtaining regulatory approval for financial service capabilities such as payment processing and credit underwriting is one of the biggest challenges to scaling and monetizing Embedded Finance for many independent software vendors. In many cases, the software providers will need to partner with a bank that performs a majority of regulatory compliance due diligence to qualify for the partnership on which Embedded Finance services are based. Processing payments or lending non-compliant business verticals presents a major regulatory risk as underwriting agencies scramble to find the offending non-compliant companies for removal off a banking

partner's network. Partnering with a licensed and insured bank partner may mean a major revenue share cut, but using the bank as a shield against regulatory considerations may allow vertically-focused software companies to benefit from Embedded Finance revenue diversification and deeper customer engagement.

On the other end of the Embedded Finance spectrum is what is called bank sponsored with both regulatory and technology considerations. These services require the individual participating companies to have a license or work under a bank or credit union. Banks that provide these services have needed to enhance their processes and needed to improve their technology offerings. Rather than present roadblocks for innovation, regulatory frameworks can act as a dynamic springboard for what is being offered. Embedded Finance innovation will become an attractive service for Banks and Credit Unions to offer through partners as a way to reinforce and deepen their community connections.

12.6.1. Compliance Challenges

As embedded finance and hyper-personalized digital banking continue to transform financial services, regulators face significant challenges in addressing the unique nature of these innovations. Traditional regulatory frameworks may not be suitable for the widespread delivery of financial services partners. Lawmakers are now in discussions around developing consolidated regulation that could affect various entities involved in embedded finance.

The challenge is that compliance models are different for various financial services. For example, risk models in banking are based on the risks of non-payment, while models in insurance are focused on likelihood of events occurring. Partnership models for taxation compliance in lending and payments may be driven by different remedial perspectives. Future transactions may be less driven by statutory mechanisms and income-tax considerations since they will be based on smart contracts on a blockchain. Other embedded models are based on certain industry occupations. For example, flight-sharing services develop rental models based on the permissible number of hours that people can drive.

Embedded finance will also drive the creation of unique specialist regulators or category managers. These are yet to be positioned and structured. The establishment of regulations that are "innovation-friendly" will help more fintechs to engage in hyper-personalization across industries, thus promoting the adoption of embedded finance. Smart regulation will also explore the potential of shared services innovations across regulatory domains.

12.6.2. Impact of Regulation on Innovation

Regulation could impact technological innovation in embedded finance as technologies are deployed not only to maximize profits, but also to ensure ongoing compliance with legal frameworks and requirements. This could desensitize the services to customer pain points and quality customers experience. For example, at the height of the payment-automation era, consumers began moving money across bank accounts via this service channel to pay vendors around the globe. Fraud alerts, and consequent monitoring of these alerts, became an expensive compliance burden however, and many banks, to ensure ongoing compliance, stopped supporting these transactions. The implied message to customers was that they represented a higher fraud and risk profile than gave banks comfort.

But embedded finance technology could be put to use in an innovative manner to ensure that compliance were continuing to be met in the most appropriate manner relative to transaction size, frequency and jurisdictional controls. Such monitoring could take place with the use of continuous transaction analysis. The challenge to innovators is finding ways to deploy and leverage new technologies to serve their business, customers, and regulatory obligations. Startups may have more difficulty navigating regulatory hurdles than established financial institutions who have a record of bank performance. Still, a greater bank emphasis on the pursuit of customer experience could cause them to innovate in ways that rival fintechs. Thus, existing regulators face the challenge of maintaining a delicate balance between creating appropriate, understandable, and transparent regulations that ensure consumer safety versus creating layers of unnecessary regulation that hamper ongoing innovation, efficiency, and the ability for consumers to gain entry and ongoing access to services.

12.7. Embedded Finance Use Cases

Embedded finance continues to unlock extraordinary new use cases and applications across fintech ecosystems. And no wonder—integrated investing, lending, insurance, payments, or even checking accounts are compelling revenue generators not marooned in a standalone app, but adjacent to the essential activities of everyday life. While some use cases shine brighter today than others, categories of merchant and service provider integrations are rethinking what finance means even down to the shopping experience, social feeds, and popular gaming spaces. Embedded finance is changing the tier structure of brands and offering the white-labeling of everything.

From the first days of e-commerce, merchant processors helped store owners handle transactions over the Internet. The list of embedded variants has exploded. Phone companies, ISPs, and manufacturers have added stores to their websites. E-commerce

sites added opportunities for banking, commerce credits, installments, freight insurance, consumer payments, or merchant cash advances. Last-mile services can offer gig worker payment platforms on their apps, while manufacturers are offering credit marketplaces from their e-commerce sites.

Fig 2: Embedded Digital Transformation in Banking

But embedded banking isn't limited to commerce infrastructure. Search engines have become vital moderators of how consumers find products. Now they're offering checkout experiences of their own.

Embedded policies for homes, cars, boats, and travel have proliferated via partnerships between insuretechs and online travel agencies, e-commerce marketplaces, credit card programs, and real estate brokers. Support for embedded insurance is growing rapidly, aided by an insurance-as-a-service platform that enables digital brands and tech companies to offer their own branded insurance solutions.

Lending platforms are also exploring the possibilities of embedded finance. However, a loan is a unique transaction—a commitment of debt lasting for months or years that consumers don't undertake every day.

12.7.1. E-Commerce Integrations

The booming e-commerce space is undergoing a paradigm shift that directly affects almost all aspects of how goods and services are exchanged and how customers experience the whole process. Key to this transition is enabling accessibility to services such as payments or logistics directly within the e-commerce platform. This

development is strongly driven by the phenomenon of wallet share, which suggests that the more services or products a customer uses within the e-commerce platform, the more relationship capital is created, increasing the likelihood of returning to the specific store or marketplace. Providing embedded financial offers as part of the purchasing journey facilitates this process since it strengthens the focus on branding, customer experience, and conversion.

Buy Now, Pay Later products are the most commonly provided embedded finance offerings in the e-commerce space. Populating the customer's point of sale with possible payment options for instigating the decision to purchase holds some additional risks for the marketplace. Providing credit at point of sale has always been one of the central revenue areas in retail banking. Having a critical number of returning customers, e-portals can leverage customer relationships and analyze not only their current but also past shopping journeys at the marketplace to offer tailored lending products. Apart from BNPL, a growing number of e-commerce providers are embedding alternative settlement and payment methods into their platforms. Integrating crypto or social media payment into e-commerce transactions permits sellers to access new customer groups, fueling the creation of a unique shopping experience.

12.7.2. Insurance and Financial Products

There are traditional partnerships between insurance companies and banks, usually involving a banking product acting as the distribution channel for an insurance product, or an insurance product leveraged by the bank to relaunch a banking product which is seeing a decrease in client interest. Take, for example, credit life insurance, with banks mandatorily selling it when customers take a mortgage loan; or universal insurance products, which have life and health risk components and invest client funds through bank investment vehicles. As the trend for evolution towards embedded finance arrives, banks will be dispensing financial insurance covering short-term risks; while insurers will offer risk-based financial products returning market performance, sponsored by banks. Four perspectives of these converging financial and insurance offerings are highlighted: products, customers, UX, and tech stacks.

Some insurance concepts are borne out of capital insurance, with its indemnity concept and dependence on technical provisioning. A short-term premium paid or a drawdown on the capital at risk is the cost of financial insurance during the saving term, for events such as bad market performance or flooding. The aim is to return capital value and a small premium. Partners with banks to build a UX that simulates financial or embedded insurance for financial goals. Associated with both companies, banks act as insurance brokers. Technically, together with other third parties, insurers with dedicated tech

stacks offer services and assume risks. These third-party services and the associated capex, opex, and service levels are also important elements of the offer.

12.7.3. Lending Platforms

Consumer demand for financial products has far outstripped supply; the aggregate funding gap for micro and small to medium-sized enterprises (SMEs) in developing countries is estimated at approximately $5 trillion. This presents a tremendous opportunity for lenders. Embedded finance enables any organization to offer customized, personalized financial products to their existing customers, often with more favorable terms than traditional lenders and credit providers can offer. Financial technology companies are utilizing vast troves of user purchasing, interest, and behavioral data to assess the creditworthiness of their clients with far greater accuracy and efficiency than banks have traditionally been able to. Cross-recipient data analysis is facilitating the automated verification needed to make branches and face-to-face human assessment obsolete. Companies embedded into the purchasing or lending journey, like tech platforms that provide B2B services to other companies, can provide working capital loans to their clients by analyzing their purchasing profile and cash conversion cycle. Countries like Mexico are seeing local ecommerce enablers and logistics go-tos for groceries and food service delivery utilize their role in the daily cash flow of SMEs to offer quick credit. Companies embedded into the lending process can facilitate verification and loan application with little cost to lenders, while monetizing the process for lenders by providing them a creditworthy borrower at an advantageous rate. Innovation is still nascent in this area; a few companies have built APIs that support loan syndication and modeling in loan management systems. As the model matures, fintechs or banks will support a new ecosystem of credit underwriting, origination, and servicing partners.

12.8. Challenges in Implementation

Digitalization has significantly transformed the banking and finance sector, resulting in unprecedented financial insights and personal user journeys capable of increasing loyalty and engagement. Using the newest digital advancements to develop intuitive banking experiences that boost customer loyalty, embedded finance solves the significant challenges and enables financial services to be seamlessly integrated into any digital platform. After an overview of the crucial aspects of existing and forthcoming solutions, hyper-personalized customer behavioral data are retrieved and monetized across banking systems and third-party products in future embedded financial solutions.

Although banks and fintechs recognize the potential impact of embedded finance, a big number of them are still hesitating to implement it over both entry barriers and the capital and financial system model challenges. Scale becomes an issue and understanding what teams, tools, and technologies to establish internally becomes crucially complicated. Fortunately, understanding the difficulties of embedded finance as a new product category provides a propeller for banks and fintechs to get resources, upskill teams, or plan the necessary partnerships. We describe some of the major challenges paralyzing the uptake of embedded finance in an act-theory approach, divided into motivations, behavioral psychology, technology, and entry barriers.

The biggest concerns regarding implementing embedded finance lie within privacy and transparency. Customer engagement is boosted when brands provide products and services that benefit from connecting existing datasets, such as data that combine customer interactions with the retail brand and the banking relationships with the financial institution, but this is not disclosed at any level. Finding the right data balance without scaring users away from the smart use of enabling services is sensitive. Payments and finance in general are intrusive and need to ask for some of the user's most intimate details and this makes it ever so crucial to ensure maximum reward and a total seamless approach for the user.

12.8.1. Data Privacy Concerns

Data privacy is emerging as one of the biggest barriers to embedded finance adoption. Many consumers will not take kindly to brands like fastfood outlets or streaming platforms that offer financial products unless they are confident that sensitive data such as SSNs or bank account details are safe. Unfortunately, most people are skeptical about brands' lax attitudes toward data privacy since data breaches remain quite common. Recent years have seen significant incidents involving the absconding of personal information from billions of users. These acts of negligence have opened the floodgates for criminals to engage in identity theft, spear phishing, and other fraudulent schemes to the detriment of the consumers whose data has been exposed.

Data-centric fintechs can help alleviate consumer fears in this respect. But brands must ensure that any sensitive data they handle while offering embedded finance facilities are protected at all costs. Even if data is stored properly, it should be to a bare minimum. It must be deleted as soon as it becomes redundant and the procedure for how it is stored should be made transparent for consumers, who should be given control over their own data. Any communications with banks and other financial institutes must be heavily encrypted using the latest technology on the market. Brands must also have airtight security measures in place to block unauthorized access by hackers.

Brands offering embedded finance products without prior experience in the fintech space usually aren't as skilled when it comes to protecting data as traditional banks. This is usually evident in the way unauthorized access to user data usually gets more media attention when it pertains to providers of marketing apps than when it relates to major banks. Brands relying on native fintechs to provide the back-end services have the advantage in this regard. Even then, however, brands need to have well-structured internal policies in place to avoid a scenario that exposes them to user backlash and resultant financial penalties.

12.8.2. Technological Barriers

The field of hyper-personalization takes advantage of big data, with the purpose of analyzing it, in order to offer products according to the profile and needs of customers. Consequently, hyper-personalized digital banking involves the collection of a wide variety of personal customer data, as well as the use of advanced analytics capabilities in order to offer personalized services at the right moment to each customer. However, various barriers need to be faced, which may delay the full deployment of this offer in digital banking.

While digital investigation allows the collection of valuable unidentified data that could be used as input information for personalization algorithms, it is not yet so widely applied and many digital banks are still at a relatively low level of development. Customer benefit delivery is either based on functional utility value or based on brand choice value. Brand value is based on objectives that are difficult to identify and measure, such as prestige, social status, and individual self-image in social life. This requires the use of advanced data optimization science, in order to avoid any mismatch between the products offered and the real benefit that customers expect. The lack of sufficient resources to properly identify the attitudes and lifestyle choices of customers could seriously compromise the effectiveness of a hyper-personalized digital supply.

Moreover, companies providing core banking processing technology often limit the opportunity to implement a hyper-personalized strategy. Commercial software, while offering the easiest and quickest solution, could prevent banks from obtaining and managing the specific data necessary for micro-segmentation. This barrier is particularly prevalent at the inception stage of digital banking where adoption is limited.

12.9. Future Trends in Digital Banking

Digital banking has become an integral part of people's daily lives, but it is still in its early stages. As start-ups and technology firms enter the competitive landscape, we

expect a burgeoning neo bank sector, replete with a wealth of services that will appeal to customers who are currently unbanked or underserved. Up until now, a limited number of digital banks have appeared on the scene—comparison apps, savings banks, and cryptocurrency service sources. However, in the near future, we expect to see an influx of banks that offer a broad range of services with unique user experiences. By offering simply designed services that are specific to their customers' needs, we anticipate that neo banks will dramatically change the customer experience and provide new and exciting customer engagement opportunities.

We have long predicted that IoT will revolutionize the way we live, and the glacial but steady deployment of networked devices is finally occurring. Naturally, this will be mirrored in our financial lives, where a whole host of transactions will be completed without needing human input. These transactions will also generate reams of data, providing the basis for new services and business models. To make this a reality, banks will have to invest in platforms that will encourage innovation, while fintech companies will be essential partners in this journey. Industry participants who are, or become, adept at using IoT data will be able to design compelling services throughout their customers' lifecycle—services that can also be monetized with sales of contextual third-party products through digital channels.

We have said for many years that partnering with fintechs is the new normal for the banking industry. Incumbent banks have long recognized that they alone cannot provide the type, quality, and speed of services that are being demanded by their customers. Instead, they have been building strategic fintech partnerships to hasten their development of digital products through outsourcing and co-creation. Banks are no longer able to stand apart from the fintech revolution; they need to actively take part in fintechs' development and success.

12.9.1. Rise of Neo-Banks

In addition to traditional banks and credit unions, digital banking is home to a growing collection of digital-only banks that offer most or all of the same services as more established institutions. These neo-banks often fill important service gaps in the personal banking space by appealing to a niche customer base who are seeking more flexibility, technology-savvy products, unique promotional opportunities, and speedy onboarding. Unlike traditional banks and credit unions, neo-banks do not have to adhere to the same regulations regarding capital reserves, physical security, and privacy as established institutions. Instead, neo-banks partner with bank brands and FinTech companies to provide services that their banking incumbents might offer directly under their own brands if not for stricter regulations and guidelines, including:

Because of their more flexible approaches, neo-banks have fostered easy-to-navigate online interfaces and an added focus on the user experience. They apply the same design concepts and product features that have shaped the user experience for digital-native brands, leading to zero-friction onboarding processes. Within days or even minutes, a new customer can establish a bank account, acquire a debit card, and begin making financial transactions. This frictionless experience has set customer expectations when it comes to both onboarding and the user experience itself. Digital banking customers expect intuitive, mobile-friendly platforms and straight-through processes for normal service and transaction requirements.

12.9.2. Integration with IoT Devices

There are lots of IoT devices that could be integrated within the digital banking ecosystem. Smart fridges, for instance, could be integrated with food and beverage delivery partners and allow users to replenish stock, automatically reducing their bank balance. IoT also opens up other, more effective channels through which banks can interact with customers, helping them on their financial journey with relevant and timely prompts. Some devices might even provide a mechanism through which customers are rewarded for their loyalty – think smart TVs and brands rewarding customers for watching ads. Coins might even be rolled out to popular IoT devices, which banks can set up accounts for. These 'IoT Coins' would then enable the devices to carry out transactions among themselves as well as with their manufacturers and service providers, and banks would ultimately get to share in the fee revenue associated with such services. From identity and payments to crypto and rewards, IoT could support the entire financial ecosystem.

Mobile phones and their apps have dominated consumer engagement in financial services. However, the banks of the future will seek to integrate their services into other frequently used platforms – like communication, transport, and commerce. The Internet of Things (IoT) may well be the next frontier for consumer engagement, allowing banks to offer more useful and contextualized services on appliances and devices. Communication apps will still integrate services through plug-ins, but smart devices acting as consumers themselves may allow for completely new experiences and business models. Crypto, loyalty programs, and micro payments along with 'coins' working across brands are just some of the possibilities. These real-time responses could even replace bank accounts altogether; IoT coins could help smart devices automatically pay for replenishment like smart fridges ordering groceries or smart cars recharging their batteries. Although it might seem radical, there are other equally strange platforms that might someday allow for financial services engagement. Smart TVs, for example, could allow customers to buy available products advertised during movie programming.

12.9.3. The Role of FinTech Partnerships

Embedded finance allows account services, loans, insurance and payment processing to be integrated into virtually any online or mobile service or application. Movement of clients' money happens on multiple channels beyond the bank's platform – on marketplaces, mobility and e-commerce platforms, while payments are made with debit and credit cards, wallets, buy now pay later from retailers or brands, using cryptocurrency or via social media chatbots. Future digital banks have the opportunity to monetize it all too, servicing B2C, B2B and B2B2C digital ecosystems with strategic fintech partners, activating lending and payment services in sync with consumer buying cycles. Future trends and client profiles will require reinventing traditional specific banking periods or phases into 24/7 banking touchpoints in a client's daily life. Targeting a wider client base means activating products unlikely to be highly profitable, but enabling the partnerships that derive services revenue over long-term relations.

With almost half of all consumers interested in opening a new banking relationship, digital banks will want to reimagine both their service offerings and their partnerships. They will need to work collaboratively with fintech partners to embed financial services intelligently at various touchpoints and moments of need, ensuring that these services enhance customer experiences rather than intrude on them. Banks also need to represent the value of these services clearly during experiences, so consumers are aware of the reasons why they're being offered when they need them. This presents new challenges for banks. With increasing competition from non-banks and digital fintech players, they must ensure that their partnership ecosystem is attractive enough to draw in fintech partners. More effectively integrating new fintech services into various digital touchpoints will be essential for realizing the market potential for digital banking services.

12.10. Case Studies of Successful Implementations

The sector of convenient microfinancing through mobile technology is one of the most exciting aspects of both the financial services and technology sectors. It is not a surprise that both sectors are converging on the opportunity. We investigate how companies are developing successful new products by combining a software or service model with a financing partner. There are certainly lessons to be learned from international activity. POS loan solutions, for example, are extremely common, and recent partnerships between global technology companies and local banks show how quickly the ecosystem is evolving. In the future this will become a common feature of all electronic transactions – credit and financing options will be presented at the point of purchase. As a result, technology companies could build data-rich ecosystems that monitor and provide consumer-centric needs including lending capability for major purchases.

Given the appeal of embedded fintech services for consumers, finance and technology companies alike, it is unsurprising, therefore, that we are witnessing a multitude of new partnerships emerge across the entire breadth of services. Banks and non-banks alike are pulling together with the aim of growing market share, and building out the embedded finance services that consumers will increasingly be expecting in the future. For local fintechs in Asia, building partnerships with banks offers them that extra layer of credibility and reassures customers that they're doing business with someone trustworthy. Working alongside banks with decades of experience offering financial services serves as a strong vote of confidence in local fintechs' digital solutions.

12.10.1. Global Examples

Embedded Finance Partners identifies the phenomenon of embedding, plus numerous examples of what is happening around the world across all sectors. As embedded finance evolves rapidly, the company estimates that there are now more than 2,000 financial services APIs available globally. Some of the examples around various sectors caught our eye. Examples in reference here are just the tip of the iceberg. In the coming years, they will be supplemented by a more complete collection of more than 100 prominent embedded finance companies.

As the investment industry is about growing and multiplying one’s money, it is unsurprising to see its significant involvement in the embedding of financial services. As expected, competitors have also been attracting attention. Investment information company helps users create, track and compare portfolios, while a tech platform for financial guardianship is also gaining traction. A financial planning company that also provides clients with lifestyle management tools is making strides. Among various payment companies embedding, one is the most mentioned. This company allows others to issue physical and virtual cards from its global payment platform. Other large payment companies offering embedded solutions are also notable. In the US, merchants can take ready-made gift card programs offered by others and they avoid managing their own gift card program by offering various programs. One company has recently raised significant seed funding for a business currently providing expense tracking and reporting to help freelancers save on taxes.

12.10.2. Local Innovations

Embedded finance has been on the rise in the past several years. Now, with the pandemic changing the way we conduct financial transactions and with the informization and digitalization of finance deepening, the embedded financial service content that changes

with the times is evolving little by little. It is a focus for the digital and software industry in Japan, and Japan is also home to innovations and new embedded finance solutions.

An example of a local embedded finance solution is business insurance for jointly managed lattes. With this solution, let’s say you are a client who runs a cafe or salad restaurant chain. You have eight stores. Each store already operates on a platform that was developed by a third-party application vendor, and has securely integrated the business into the store system and the back-office system. The third-party application vendor manages the platform, and with embedded finance solutions prepared, it has now included insurance and money lending service features in its offering. You said, "It’s candidate stores that have been recorded in the system for at least half a year and are above the industry average." So two stores can access credit loans quickly and at low interest rates. As part of the embedded finance features, you are offered cybersecurity insurance. A small group of employees answer a short questionnaire, and it is possible to complete the insurance policy application quickly.

For the embedded finance solutions prepared, seven major insurance companies have provided insurance for working capital and cybersecurity. For working capital, you simply input the store address and contact information, choose the loan amount, and receive the approximate screening result in approximately 10 minutes. In the case of insurance, the offer provides an insurance premium calculation sheet based on the response to a simple questionnaire.

12.11. The Role of Customer Experience

The overall user experience has come such that the banks of today have to focus on customer experience design as much as product and service design. You cannot have disconnected experiences for the physical and digital layers. You will not find a better design than what higher-end applications have to offer. It is a complete delight to go through the design of their application. You wonder where the enterprise software dislocation went totally wrong that even basic financial applications now look and feel visually pleasing and delightful to use.

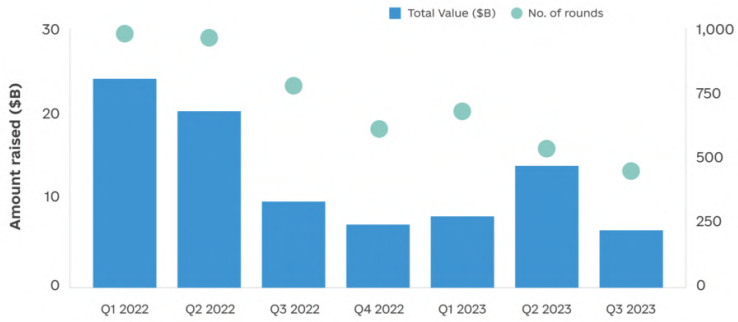

Fig : rends Shaping the Financial Services

Banks need to put customer experience in the blueprint of their applications. When the older legacy stacks are replaced with cloud-native stacks, new core banking APIs will start emerging. Once we start building applications with components exposed by the banking APIs, the user experience will also be enhanced with modular components that enhance usability and that best practice pre-packaged components for developing verticalized customer journeys and experiences which can be plug-and-played. These consumer-facing apps will be built on top of the core banking apps, giving rise to a better experience.

The omnichannel experience is now a requirement but removing the friction between the physical and digital experience requires some back-end heavy lifting. Ease of onboarding is the key to conversion for any type of financial service product or application. Customer feedback will have to be actively sought, and that user Word-of-Mouth has to be encouraged. Measurement tools, heuristics, and toolkits which measure user experiences are commonplace in other industries and can now be used by financial institutions.

12.11.1. User Interface Design

A hyper-personalized digital bank inherently adopts a design that optimizes the contextual user experience while interacting with the UI. Providing an enhanced and independent banking UI can help build stronger, loyal relationships with customers. Investing in your design is equally important as investing in the functionality of the connected financial services you offer. Especially in the ever-evolving world of embedded finance, rigid, well-trodden UI patterns risk losing your customers along the user journey, regardless of the investment you made in the fintech functionalities outside of your bank.

In a world suffering from swiping fatigue, where users enjoy technology but resent being forced to use it, it's especially difficult to encourage frictionless mobile interactions. These users want convenience over learning curves, and this is where they are consistently making animated drawings using an app that will soon be thrown into the moat, while the same users complain about banking apps that have not evolved in years because it makes no sense for the bank to innovate on the banking UI. To make this space more conducive for your customers, you need to avoid these two major user experience pitfalls. First, don't be overly reliant on third-party UX. This can introduce barriers into your customer experience that can confuse users halfway through a task. Second, innovate and personalize on top of a solid foundation. To provide a seamless banking UI experience as banks integrate into the lives of their users, banks need to build a unique interface that reflects the bank's identity and value, while abstracting away the complexities that aren't essential to making the users feel good about using your bank with confidence and perhaps subscribing for life.

12.11.2. Customer Feedback Mechanisms

Thus user feedback and customer insight are key elements for organizations to prioritize innovation relative to their competition. The banks have much more insight into customer behavior than the average firm, but firms are more data driven and close to their customers. The banks are pouring over piles of transactions trying to come up with a personalized touch to customer engagement. They can guess about what you like based on your behavior but are aware of the bias, the concealing, and the controlling motives all people harbor on a daily basis. The banks should take note, because upper management is communicating with end-users in innovative ways utilizing the power of the smartphone.

A user-centric feedback and communication strategy can significantly increase user retention. Firms need to build a feedback mechanism into their product that reveals the exact needs of their current customers. Banks and firms can use push notifications sparingly to get an insight into user satisfaction. Behavioral analytics enable user feedback solutions that can measure retention, engagement through daily active users and monthly active users, as well as cohort analysis to identify valuable customers who have not fulfilled a feature for a while. A survey system like in-app surveys or popups might be utilized to further engage and incentivize potential users to provide feedback and communication. Any small refund or discount will suffice to encourage reward sensitive users.

12.12. Future of Financial Inclusion

The future of financial inclusion holds immense promise and challenges as embedded finance continues to evolve. Innovation in embedded finance is expected to enhance financial inclusion efforts, with a stronger focus on improving traditionally underserved communities' access to financial services while improving their economic stability and well-being. Embedded finance solutions through insurance and digital banks could reduce on-demand risk and help build net worth levels over time. Those solutions can ultimately open different economic opportunities among traditionally underserved communities. Further financial inclusion attention can come from fintech providers and banks as they offer different types of products and services that smooth the obstacles to economic mobility. As financial services are embedded in the customers' journeys, the customer experience is also strengthened as financial service providers can leverage transaction data and consumer behavior in creating a more accurate, rich, and continuous view of their customers' daily lives. With that, products can be customized to improve the consumers' adoption while also taking account of improving the risk models to approve and offer credit more severely to the mass population. Embedded finance allows banks and financial service providers to better identify specific market segments and increase the effectiveness of targeting those segments, especially among untapped populations in low- and middle-income communities. With technology and the large amount of data analytics available today, banks can develop better risk evaluation models to offer financial services more responsibly.

12.12.1. Access to Financial Services

Recent developments in technology have disrupted the traditional modes of delivery of financial services. Banks and other financial intermediaries now have powerful distribution capabilities through digital platforms. New business models are emerging that blend data, technology, and financial services to catch up with the traditional financial institution at the last mile. This essay investigates how embedded finance is transforming access to financial services.

We perceive that, by embedding financial services into broader non-financial services, Payments and Core Banking as a Service unlock financial inclusion for underserved segments. In particular, we explore four research questions in the context of emerging markets: To what extent CPaaS is taking financial services closer to the underserved? What new user behavior for consumers do we expect? How does this shift create opportunities from a business perspective? And what are the implications for bank and non-bank firms?

By providing an understandable framework, rooted in socio-technological theory, we guide our stakeholders and clients in the embedded finance revolution. We characterize CPaaS with three design principles: Facilitation for the underserved, transparency in the user journey and empathy for the underserved on user engagement. Embedded finance will likely shift user-centricity in both the FinTech and banking industries. We expect a change in business models creating ecosystems built on consumer-added value instead of pure volume-based pricing. From an execution standpoint, user engagement is key to unlocking the full potential of embedded finance. In particular, we highlight four key engagement pillars: Financial literacy for trust and empathy, hyper-segmentation for enhanced products, gamification for appetite and incentive alignment for risk. Finally, we summarize key implications for banks and non-bank platforms to stay relevant in a world of embedded finance.

12.12.2. Impact on Underserved Communities

The economic and social titans of tomorrow will not just want hyper-personalized, embedded financial services; they will also demand them. Centrist and populist political ideologies broadly agree that governments of developed economies should promote policies that encourage firms to develop better products that satisfy the demands of lower- and middle-class customers. Some advocates argue that supporting fintechs focused on serving a struggling economic cohort could help revitalize the regions and urban areas left behind by globalization and technology advancement. The progressives among these advocates favor driving even deeper innovation by offering low-cost government programs to support such efforts, such as investing in seed capital or rewarding insurance and community development credit for mission-aligned fintech partners.

By themselves or in partnership with fintechs, their larger banks, or keen technology firms, governments could even much more deeply embed such personalized services into the banking apps and platforms of unbanked and underbanked retail accounts. They could seamlessly set up payment for deserved entitlements like unemployment insurance and social security, so payments never missed critical rent payments or auto loans. But this would go much more beyond basic needs. Such alternative, state-level banking programs could also purposefully move account balances over pre-specified limits into no-fee, interest-earning short-term investment alternatives, modified to meet different risk profiles, to minimize threats of populism among working-class memberships in the giant investment and recasting narratives of the automation.

In addition to economic necessity or self-interest, technology offers profound opportunities for the personal development of every individual. Local partnerships using low-cost and hyper-personalized management of financial accounts embedded in banking technology tools hold great promise for underserving communities. Advanced models, in socially constructive collaborations with other like-minded banks, will be able to stimulate, cultivate, coach, and train millions of individuals in high-risk countries who are painfully searching for hope and purpose.

12.13. Conclusion

Technologies are evolving at an exponential pace. More importantly, the sleeping giants in the financial space are quietly ramping up their investments to modernize their back-end technology so that they may keep pace with the pace of the new challengers. Integrated into an entire ecosystem of fin-fluencers, fintechs, and smart budgeting tools, hyper-personalized banking platforms will turn financial management into a quick and easy daily habit. Digital cards and accounts powered by native token-based value transfers will democratize transaction banking and payment services on a massive scale, appealing to consumers eager to optimize their financial lives, be rewarded for their financial health, and to earn income by participating in the fintechs value pools. Wealth management and investment will become automatic components of budgeting and flow-based income statements rather than singular events, offered by flexible value chain for efficient tax optimization.

All of this will enable financial services providers to reimagine the relationship on which they were built… focusing on using financial technologies to help the consumer become better at managing their cash flow, enable the consumer to live better financially in the present while being in control of their financial future. This will open new access and engagement channels to bring personalization, control, and transparency demanded by the digital generation, automated advisory at a lower cost to help every consumer improve their financial wellness. Riding on the coattails of the frenzy of the fintech space, the broader financial institutions will also open up their technology back bones through APIs. As consumers increasingly demand better API-based connections to every aspect of their financial, a rich ecosystem of integrated financial wellness solutions will follow.

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