Enterprise Architecture Specialized Group of Informatics Society of Iran

Architecture in Modern Banking Models, Presenting a Practical Approach in Neobank Architecture

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انجمن انفورماتیک ایران

Part 1: Digital Transformation in Banking Industry

Contents Overview:

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- Digital Disruption
- The Profound Darwinian Shakeout
- Transformation Towards Digital Banking
- What is a digital bank? (Temenos's Definition)
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- Major Financial Trends Impacting Banking
- 10 Technologies That Will Disrupt Financial Services
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- Digital Transformation Goals for Banks
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- Agility and Agile Architecture Principles
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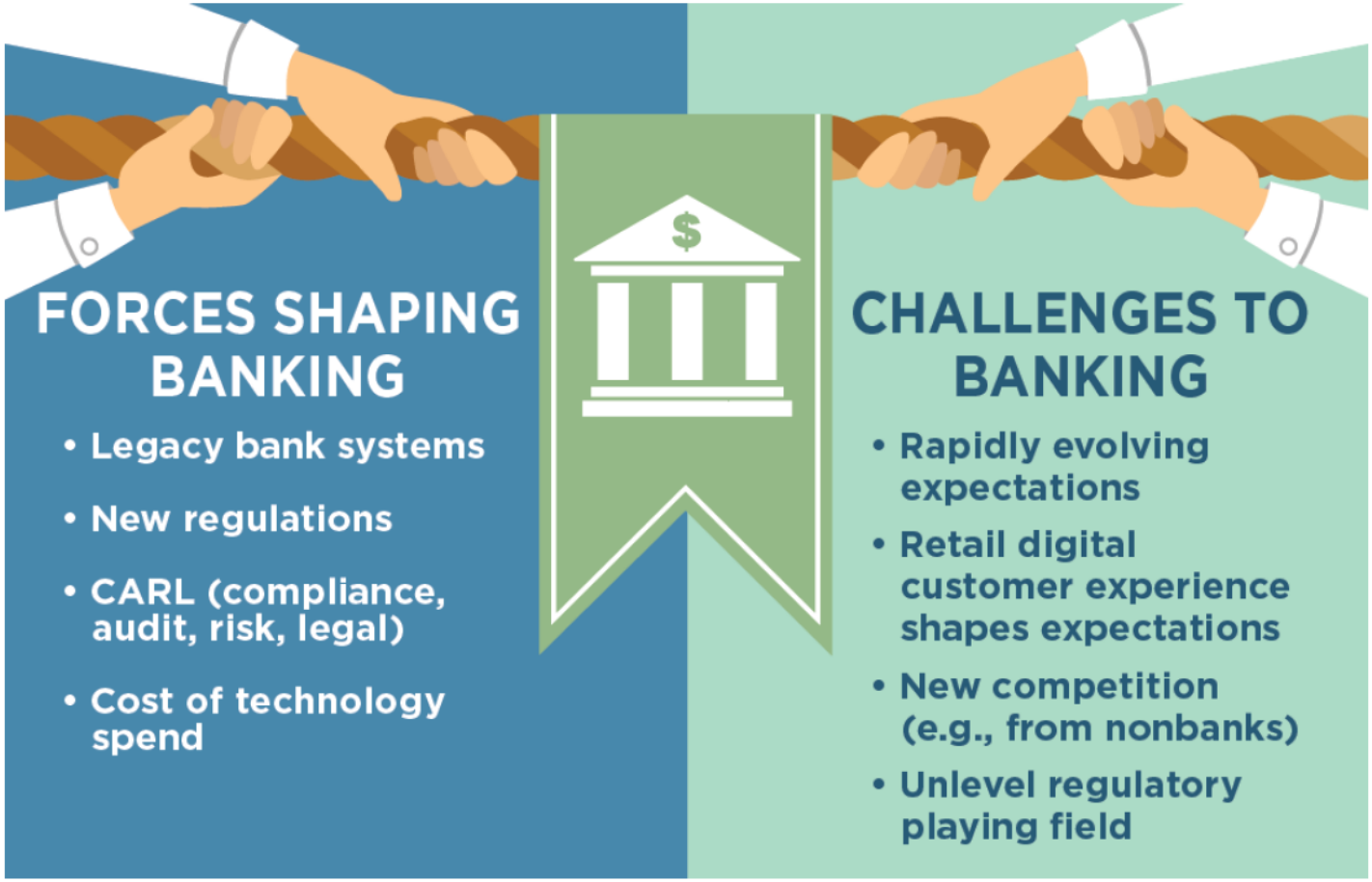
Driving Forces and Current Challenges in Banking



Greenwich Associates

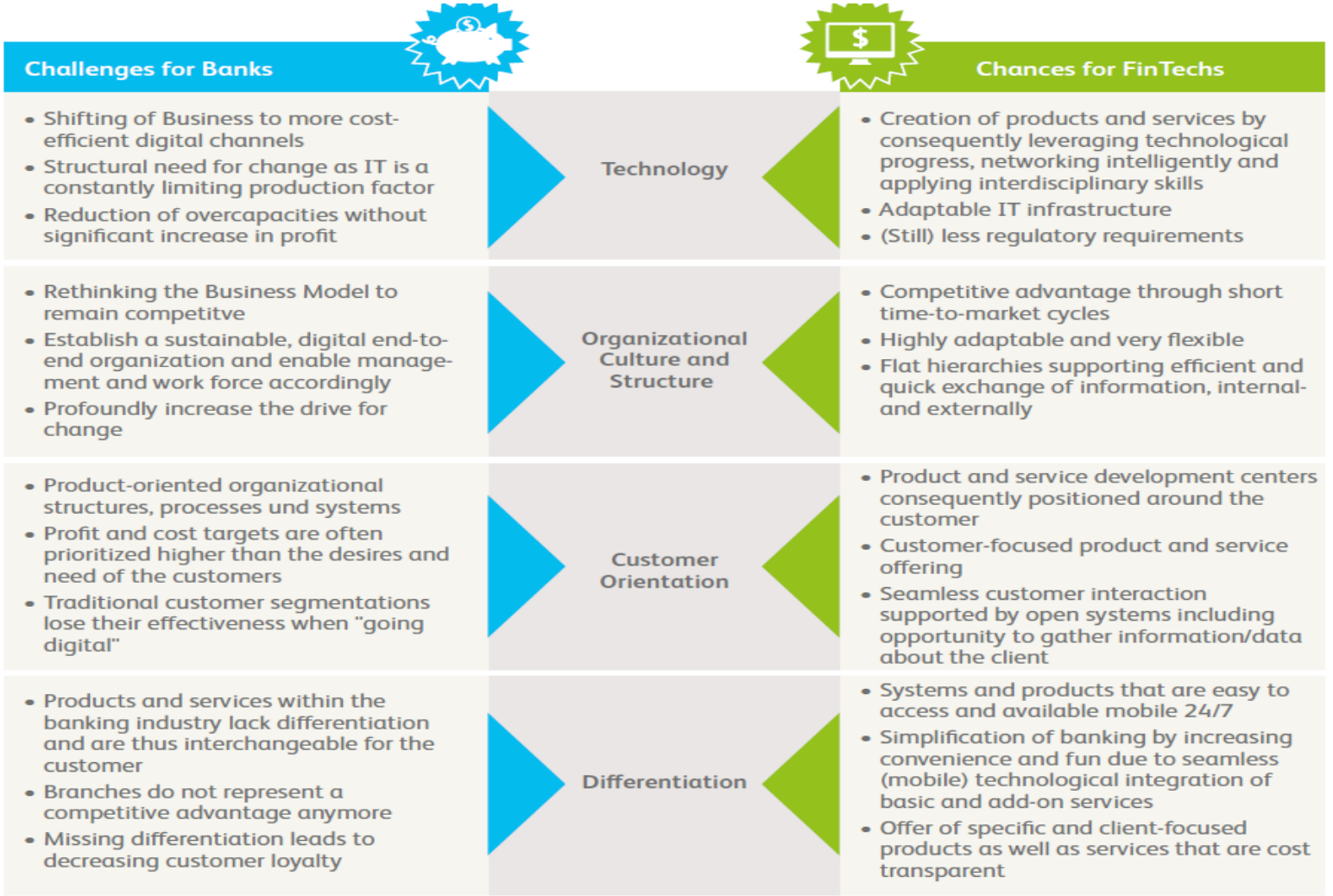
Situational Background

- Shrinking profit margins, changing customer behavior, exponentially increasing use of mobile devices, digitalization and rising competition exert pressure on the banking industry.

- Some call the development a “Revolution”, emphasizing its speed and disruptiveness. Others name it an “Evolution”, accentuating its fundamentality. Overall, the rapid technology development simplifies the market entry for new players and fuels the competition between established and new market entrants.

- The new competitor species is not only aiming at snatching market share from banks, but is attacking banks’ business models.

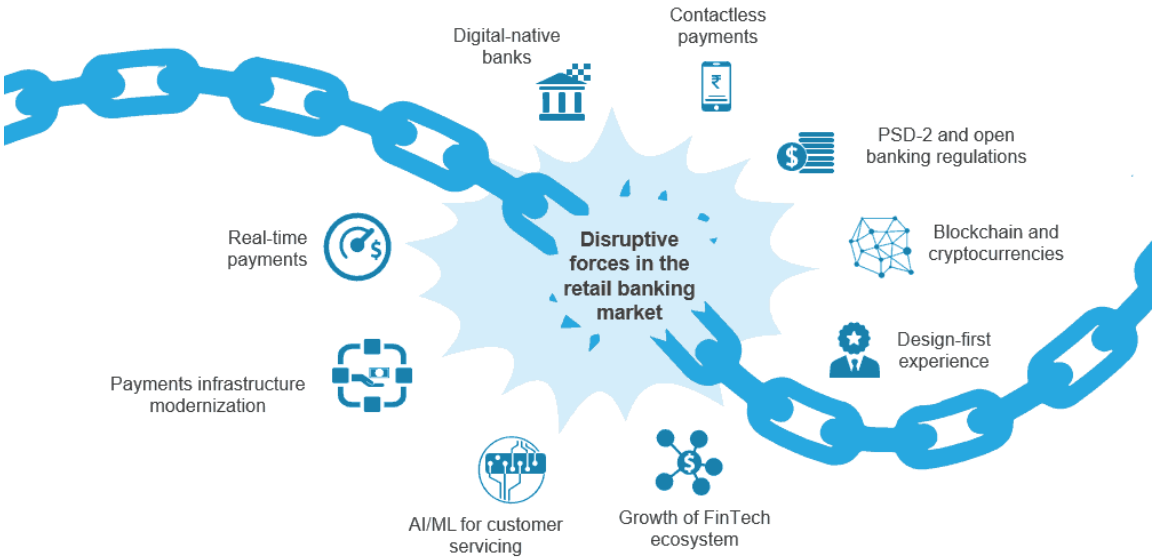
Challenges for Banks Vs. Chances for FinTechs



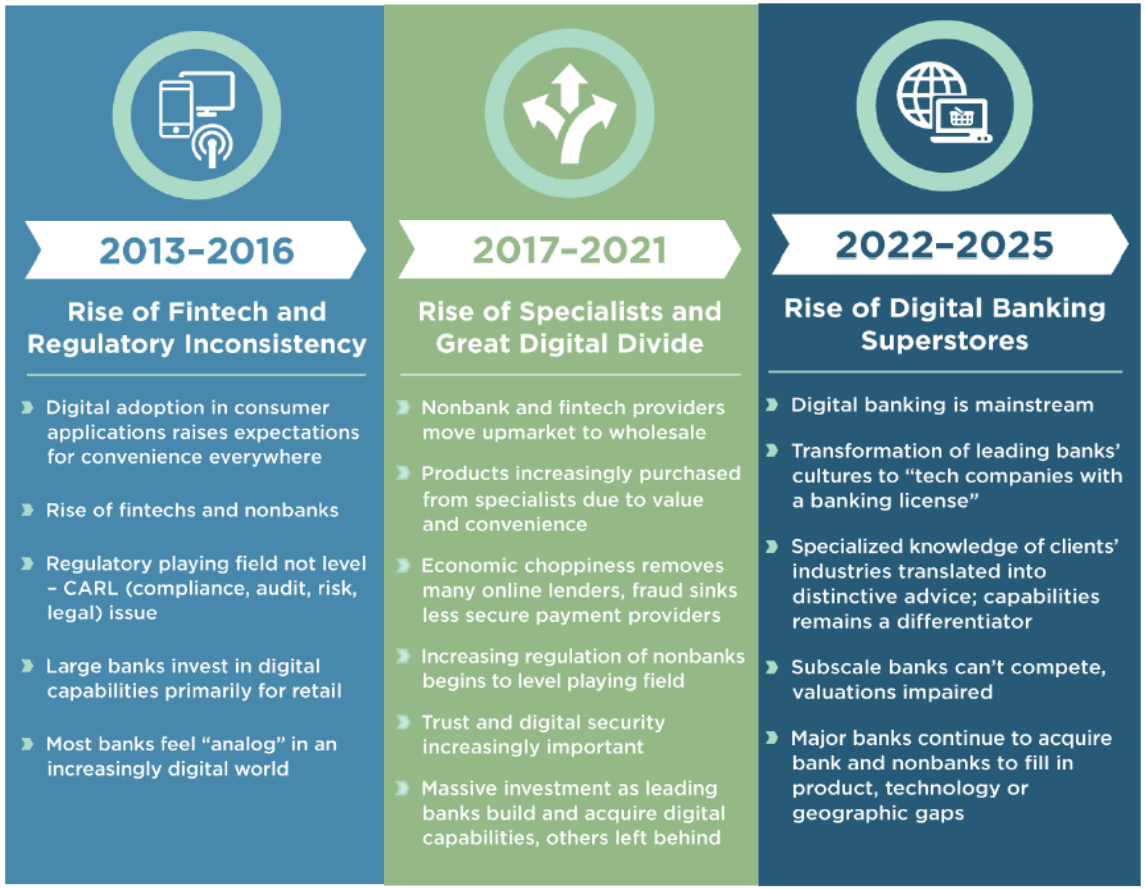
Digital Disruption

- Digital disruption is radically changing the way businesses start and grow. Over the past few years, several industries have been shaken up. Global digital transformation forces all industries to radically rethink proven business models, to change fast and continuously.

- Being agile and responsive is crucial to gaining, and keeping, a strategic advantage. As such, flexibility is key for success.



The Profound Darwinian Shakeout



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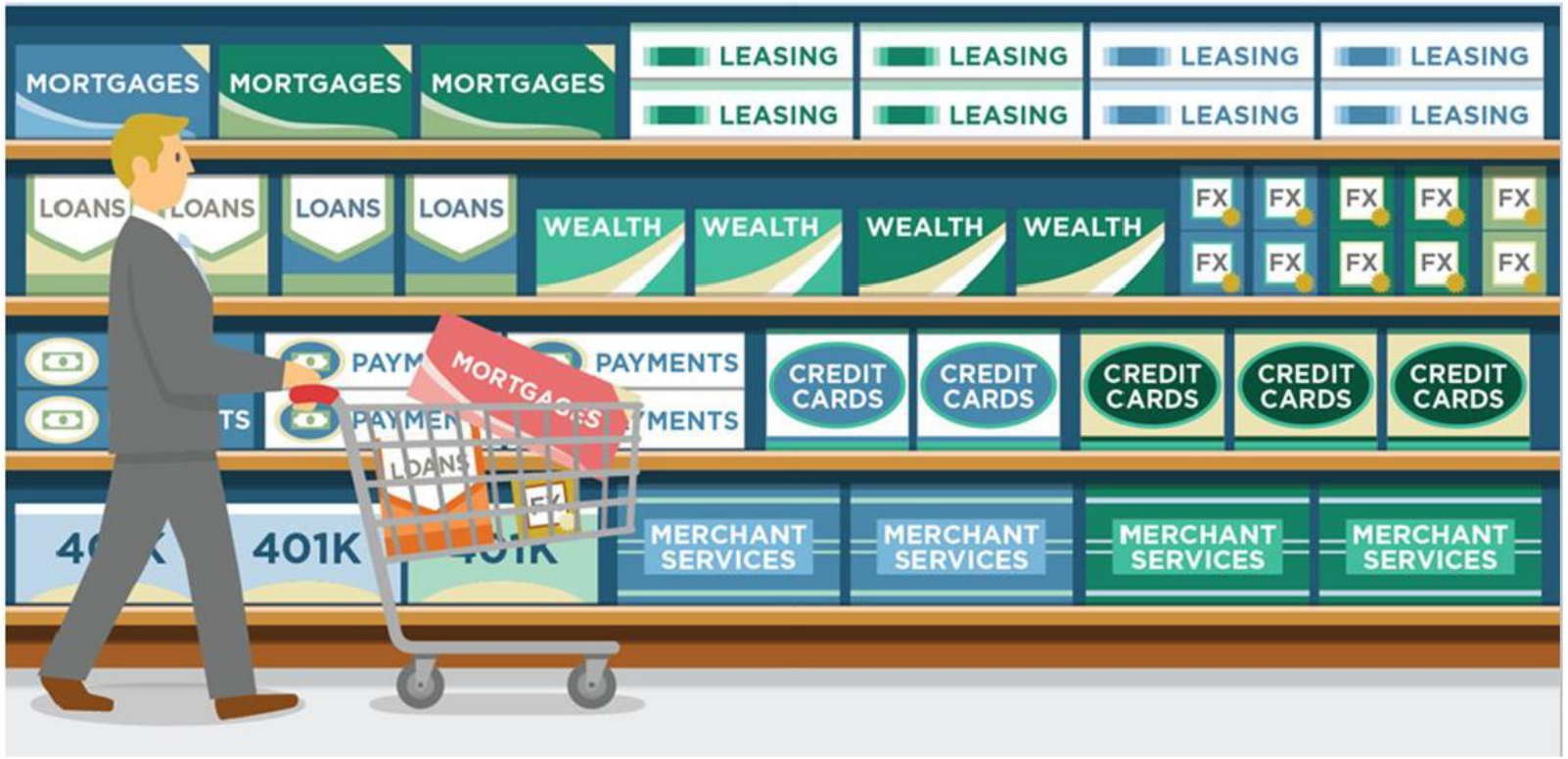
Rise of Specialist Providers

- As banks lag on digital, convenience and value, specialists seize the opportunity to fill the gaps.

Leading Banks Become Digital Financial Superstores

- Consumers will soon have access to all of their financial needs from one central location.



Banking is Entering a Profound Period of Change

- Clients' expectations of what they want from their banking provider are shifting.

"The only thing standing between banks and giants like Google, Apple and the Telecom providers will be a banking license"

Transformation Towards Digital Banking

- Banking **Clients** 2025
  - ✓ The banking client 2025 is empowered by digital bots and digitally assisted client advisors.
- Banking **Operating Models** 2025
  - ✓ Banking operating models 2025 will be characterized by intelligent automation, cooperation, and industrialization.
- Banking **Revenue Models** 2025
  - ✓ In 2025 we will see entirely new revenue models in banking.
- Digital Banking **Platforms** 2025
  - ✓ 2025 banking platforms will be open and interoperable and designed from front to back.
- **Data-driven** Banking 2025
  - ✓ Data-driven banking will allow banks to develop entirely new business models and products and optimize their processes.
- Banking **Value Chain** 2025
  - ✓ There will be no isolated banking value chain in 2025; instead we will see new cross-industry ecosystems.

What is a digital bank? (Temenos's Definition)

- **Temenos** believe that being truly digital means enabling "**experience driven banking**". This needs to cover both the **customer experience** and the **execution experience**. A digital bank offers customers contextualized, seamless experiences that transform the customer journey. And becoming a digital bank means delivering a compelling and relevant customer and execution experience through an open, integrated and flexible architecture. True digital banking can be condensed into two key and distinct factors:

  - ✓ **Customer Experience** The sum total experience that enables customers to self-serve, in real time, via multiple devices, with environmental context that results in a personal and relevant experience. This requires online access to all products and services as well as the real-time customer intelligence to be able to provider relevant, contextualized and personalized content and offers at the right time and on the right device.

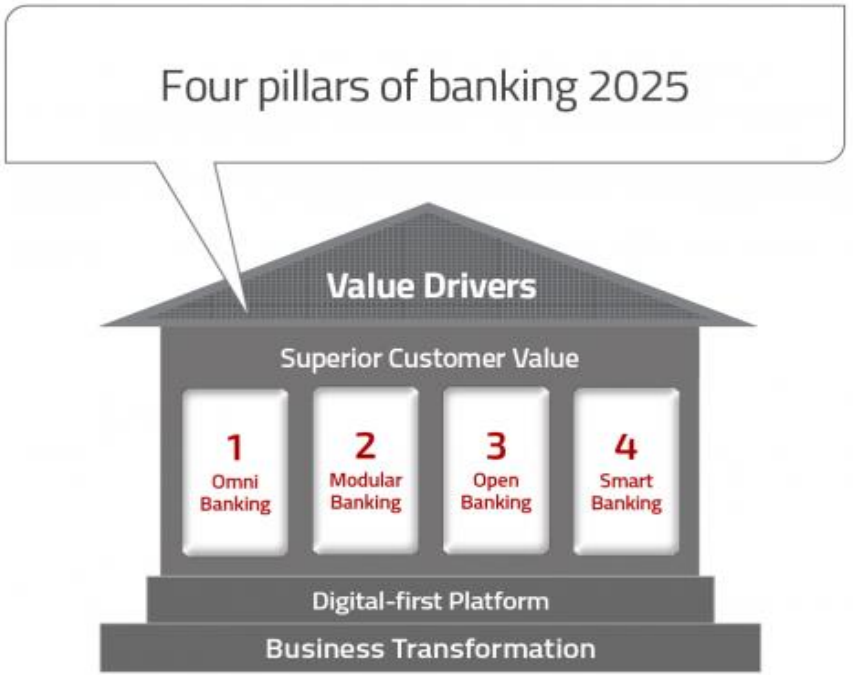
  - ✓ **Execution Experience** The sum total experience that enables organizations to deliver on-demand services with minimal human involvement via straight-through-processing whilst enabling internal bank users to serve clients via offline channels and continuously improve products and processes. This requires an end to end digital platform and architecture.

What is a Digital Bank? (Temenos Digital Equation)

- The fundamental digital equation of Temenos: A+B+C = D
  - ✓ A = Anytime, anyplace, any channel – this is what customers expect.
  - ✓ B = Better banking, beyond the traditional banking service – using customers' data to become a virtual advisor
  - ✓ C = Contextual – the service, communication, rewards and products you offer to meet customers' expectations, needs to be driven by data and analytics and personalized to their requirements.
  - ✓ = D – Digital banking

Four Pillars of Digital Banking

- **Omnichannel Banking**: The streamlining and integration of channels to ensure a positive and seamless customer journey across all potential touch points.
- **Modular Banking**: A systems architecture that has interchangeable components that can react to market and institutional changes quickly.
- **Open Banking**: The ability to use open APIs to connect internal and external capabilities, building experiences that may extend beyond banking services.
- **Smart Banking**: The use of advanced analytics to leverage data for personalized engagement and experiences.



Major Financial Trends Impacting Banking

- According to researches from Atos, the four most transformational challenges and opportunities for the future of banking through the next 5 years include:

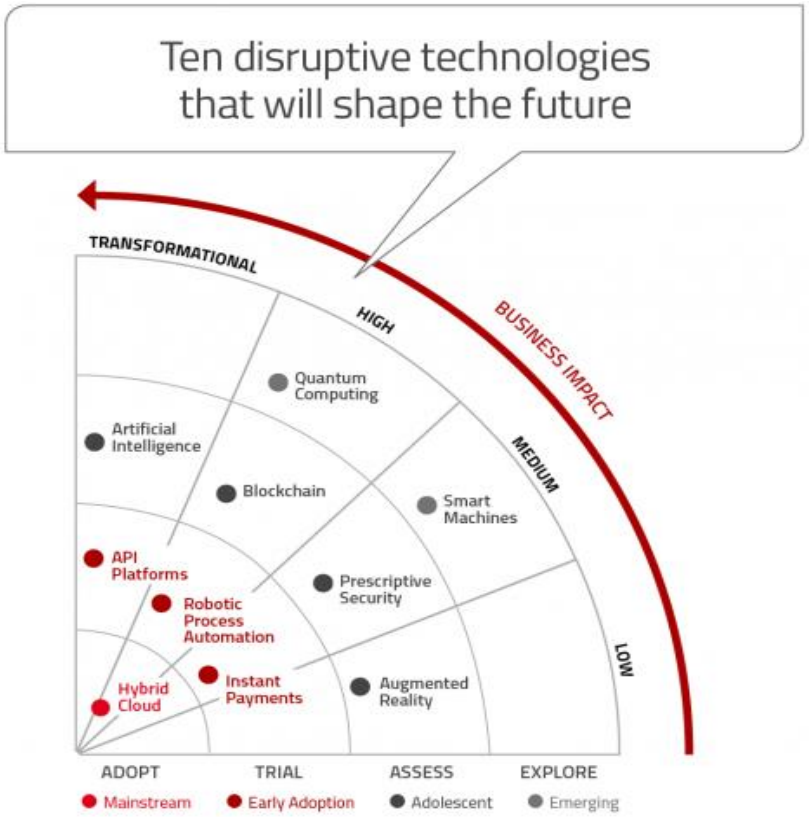
  - ✓ Response to **customer needs**: Ranked as the most important trend in each of the last 4 years in research done by the Digital Banking Report financial institutions need to shift from physical interactions to digital engagement. For banks and credit unions that digitize customer journeys, there can be a significant benefit in revenues, cost reductions and customer satisfaction.

  - ✓ Optimization of **costs**: Because of the efficiencies of digital-only competition, banks and credit unions will need to consider divesting from non-core operations and leveraging intelligent automation. In addition, organizations will need to reinvent back office processes and replace aging infrastructure.

  - ✓ Creation of new **revenue streams**: Open banking and the use of APIs will open new opportunities for both cost reduction and revenue growth. As the banking ecosystem expands beyond traditional banking services, new products will be developed and segments served that will provide differentiated offerings and monetization opportunities.

  - ✓ Development of **security and compliance** systems: With customer data becoming a 'product' for many financial institutions, the need for enhanced security and advanced insights (AI) will become a differentiator from both a compliance and customer trust perspective. This can lead to reduced costs and potential business growth.

10 Technologies That Will Disrupt Financial Services in The Next 5 Years

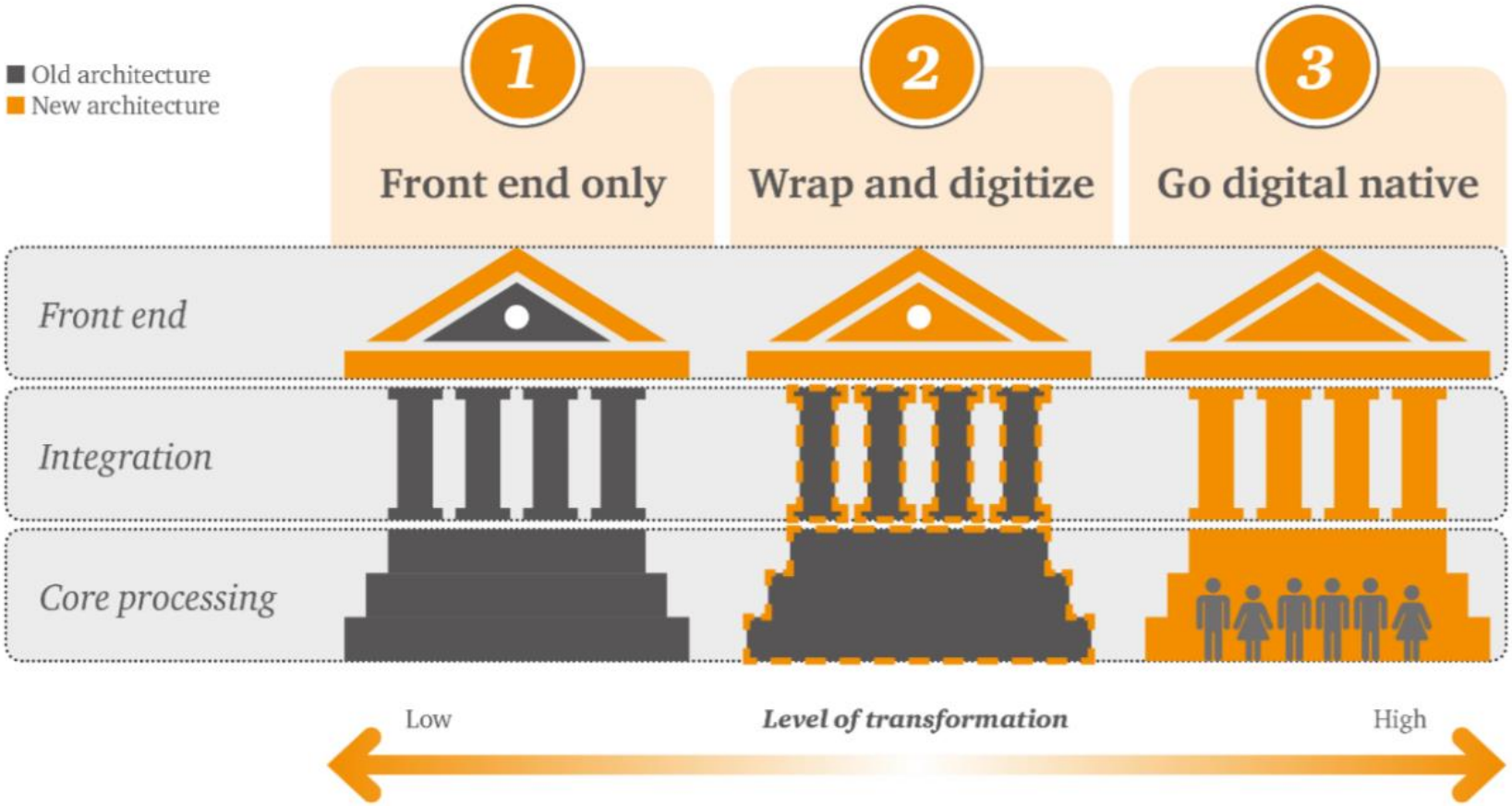


SOURCE: Atos © November 2018 The Financial Brand

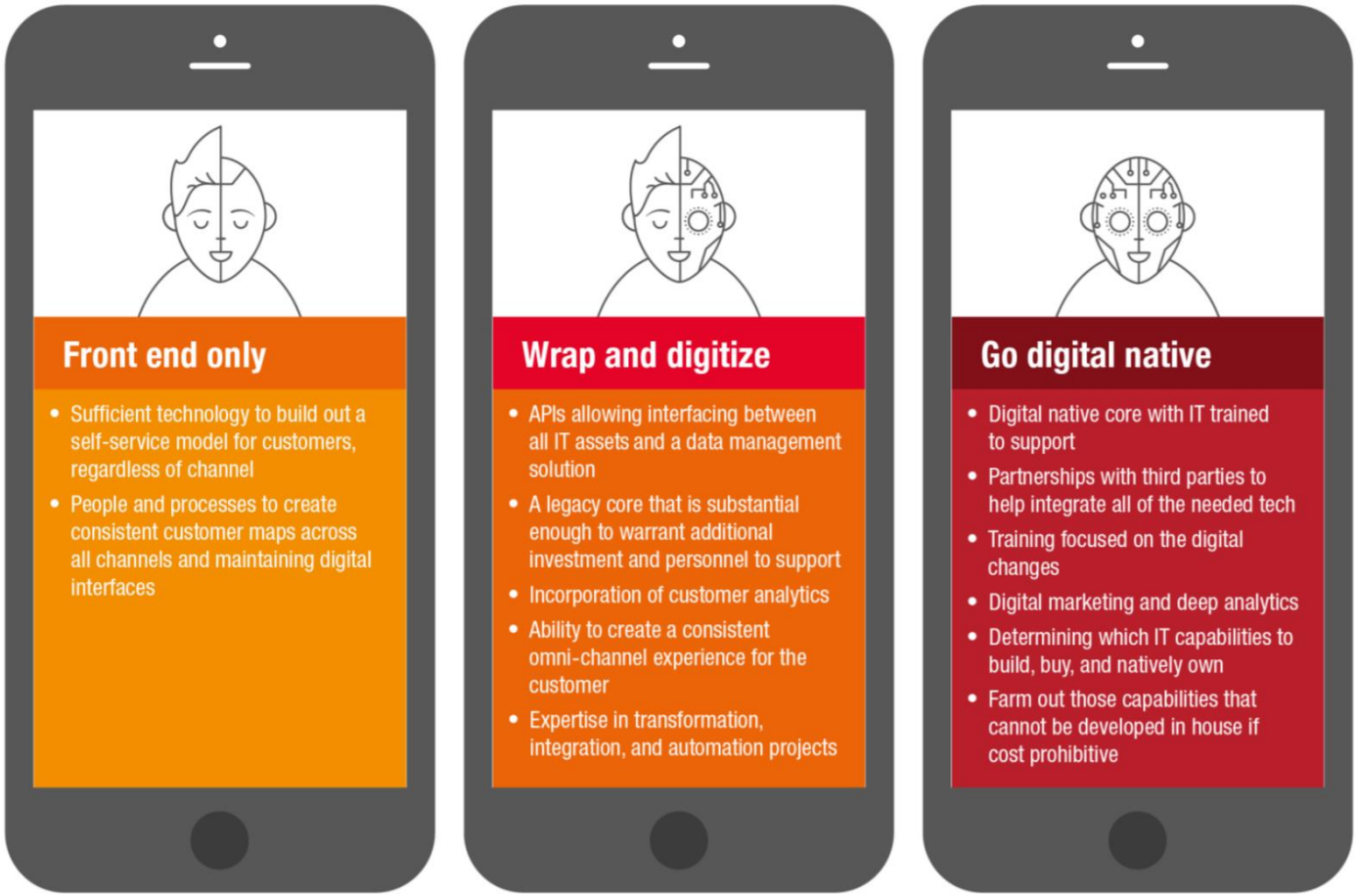
- As opposed to technology taking a secondary position, supporting only the processing of transactions, future technologies will be more customer-centric and efficient, and provide more targeted, secure and intelligent solutions. With technology as the driving force in the future, organizations will be able to redefine themselves to be more competitive and responsive to marketplace needs.

- Atos developed a very helpful Global Banking Technology Radar that provides a perspective on the technologies anticipated over the next five years, the business impact of the technologies and the timing of integration.

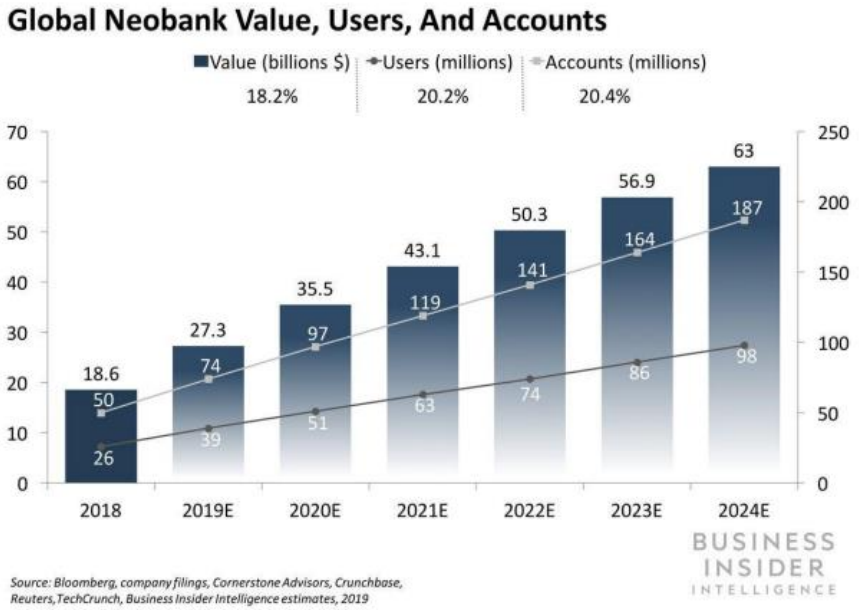
Banks are Responding in three different ways, Which one(s) are you adopting?

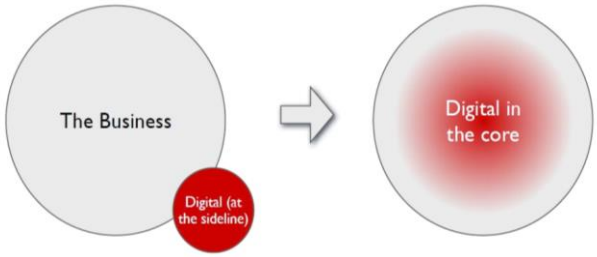


Factors to Consider When Choosing a Digital Strategy



DBS Bank Case Study





Piyush Gupta
CEO of DBS Bank
Singapore

Digital Transformation Goals for Banks

- **Adaptive** to known and unknown changes
- Be the **financial service provider** in whatever Stakeholder Journey
- Defining new **Business Operating Models**
- **Information Driven** (operational BI, AI, Common business language)
- **Lowering Development Costs** to realize Integration/Interoperability

Digital Challenges

Reduction of integration/interoperability costs

- Monolitic systems
- Stofe pipe systems
- Point connections
- Interface adaptors

Regulation for

- Disclose financial information for TPP's (Third Party Providers)
- Security and data protection (e.g. GDPR)
- Financial and Risk Reporting

New Ecosystem, with Industry Integration

- Fintechs, Cross Industry
- Open Banking Data
- Open banking API
- Business Service Sourcing Models

Information Driven

- Single Source of the truth
- Data Warehouses, Data Lakes, NoSQL, Real Time BI, Next best offer, context specific offers, risk patterns, ...

Agility

- Time to market
- Adaptability

Agility

Financial Institution's DNA needs to become agile-proof

Agility

“Agile” ≠ "doing *Scrume*"

- ***Agility*** is a **persistent behavior** or ability of an entity that exhibits **flexibility** to accommodate expected or unexpected **changes** rapidly, follows the **shortest time span**, and uses **economical, simple, and quality instruments** in a **dynamic environment** (Qumer & Henderson-Sellers, 2008)

- **Main Areas of Agility ?**
  - **System agility**: agility in your operational systems and business processes
  - **Process agility**: agility in your development and change processes
  - **Business agility**: agility as a strategic focus, based on your process and system agility

Financial Institutions need **Agile Architecture**

Agile Architecture Principles

Separation of concerns

Loose Coupling

Reusability

Encapsulation

Interoperability

Service Oriented

Simplicity and transparency

BIAN as an Enabler, Here BIAN Comes in

Founded:

2008 by (amongst others): SAP, Microsoft, ING, IBM, Credit Suisse

Not for profit organization with over 70 members worldwide

Mission statement:

To provide the world with the best banking architecture. To be the banking technology standard.

Central objectives for IT in the banking industry are to lower the IT and operational costs of the bank and help banks mitigate the risks associated with technology innovation. To provide a trusted roadmap for constant innovation. We create best practice architecture that the world's banks can rely upon 100%. To gather the best minds in banking architecture for the world to share in an open way.

By collaborating and sharing in an open way, the best expertise across our global ecosystem of leading banks, technology providers, FinTech players, academics and consultants to define a revolutionary banking technology framework that standardizes and simplifies the overall banking architecture.

BIAN is offering an Open Banking Reference Architecture Framework

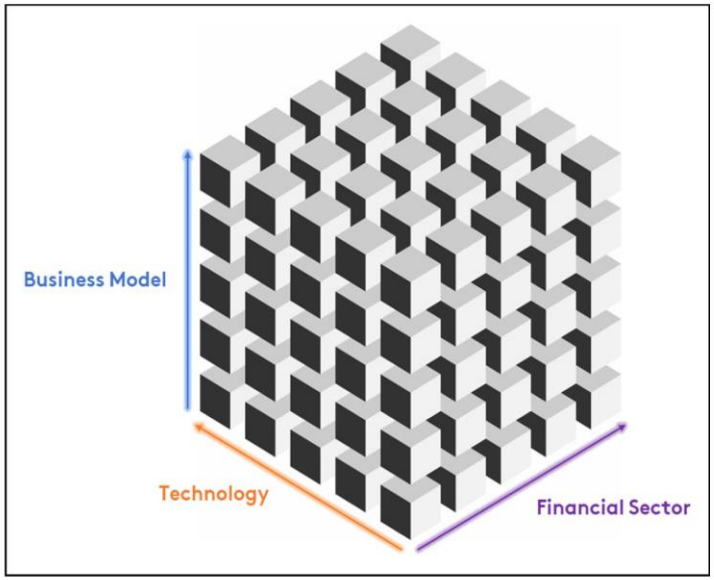
Part 2: Evolution in the Provision of Banking Services and the Emergence of Fintechs and Neobanks

Contents Overview:

- Analyzing FinTech's Dimensions
- Evolution of Global Neobanking Landscape
- Neobanks Overview Worldwide
- What's the Difference Between Neobank and Bank?
- Types of Neobanks
- Overview of Full-stack and Front-end Neobanks
- Why is Neobank the Best Option for Users in 2022?
- Why You Should Start NeoBank? Some of the Strategic business Advantages
- Key Trends Influencing the Neobanking Industry
- Top Neobank Development Problems, Mistakes and Challenges
- Neobanks Must-Have Features in 2022
- Neobanks Advanced Features in 2022

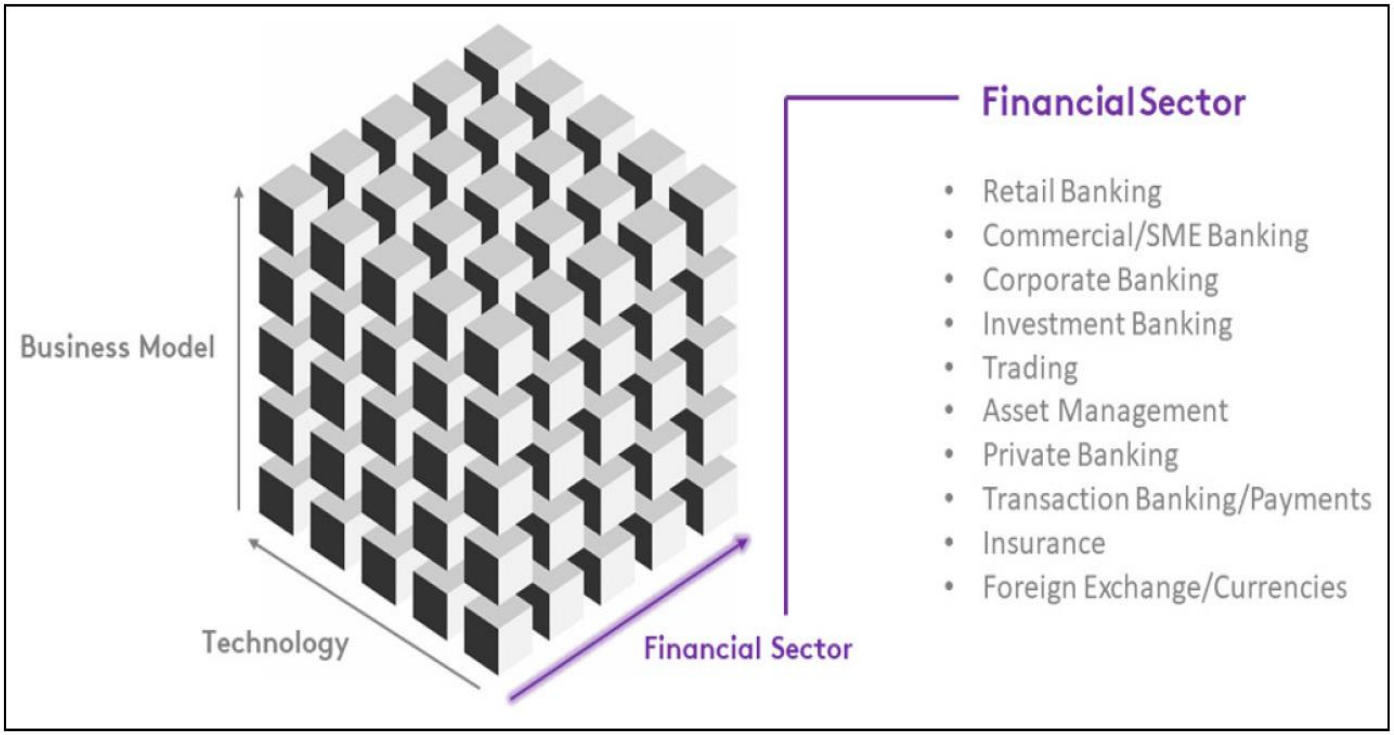
Analyzing FinTech's Dimensions

- The Fintech Cube combines financial sector, business model, and technology factors. You need to think about each of these factors:
  - ✓ Which part of finance is being impacted (financial sector)?
  - ✓ Which business model is being used?
  - ✓ Which technology is being used?
- FINTECH Circle has coined the term Fintech Cube to describe the intersections of these factors.
- The Figure illustrates this cube, in which there are three axes:
  - ✓ The financial sector on the x-axis
  - ✓ The business model on the y-axis
  - ✓ The technology on the z-axis

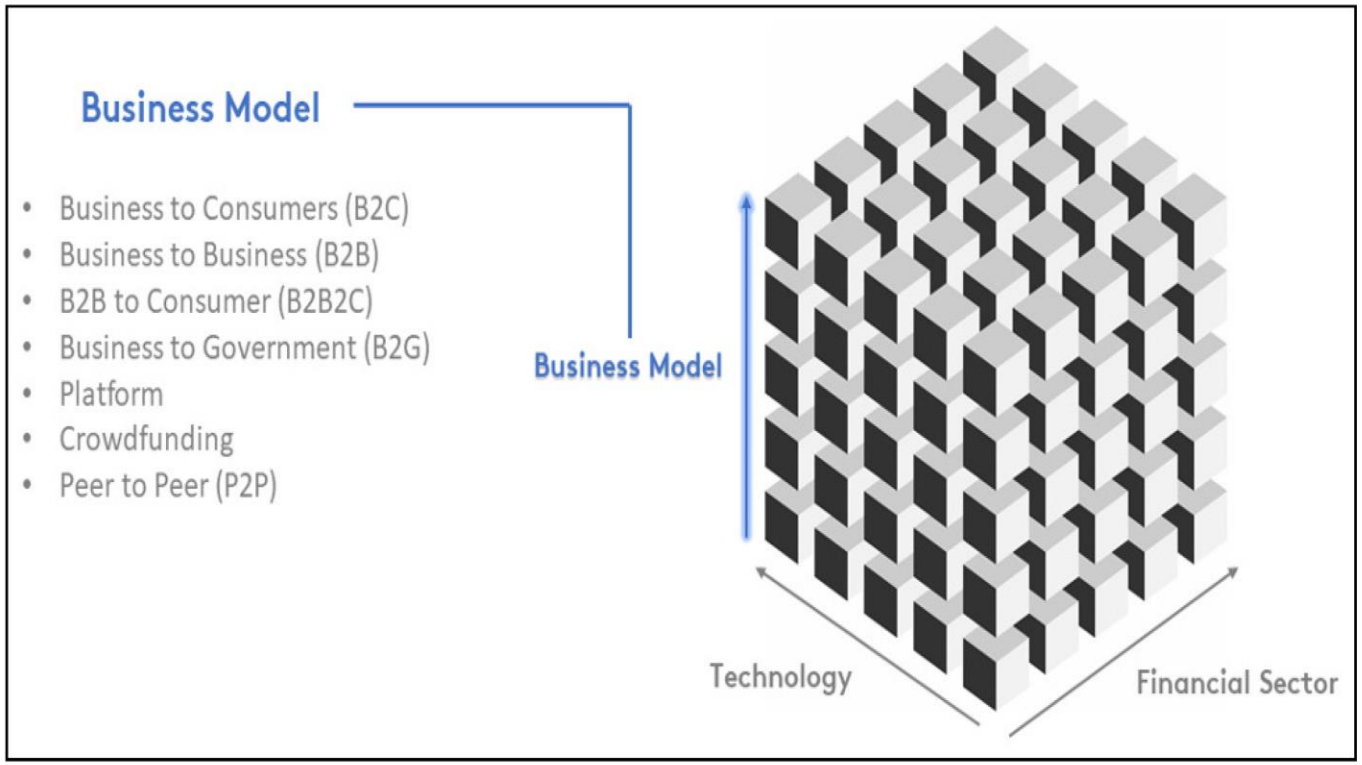


Source: FINTECH Circle, 2020

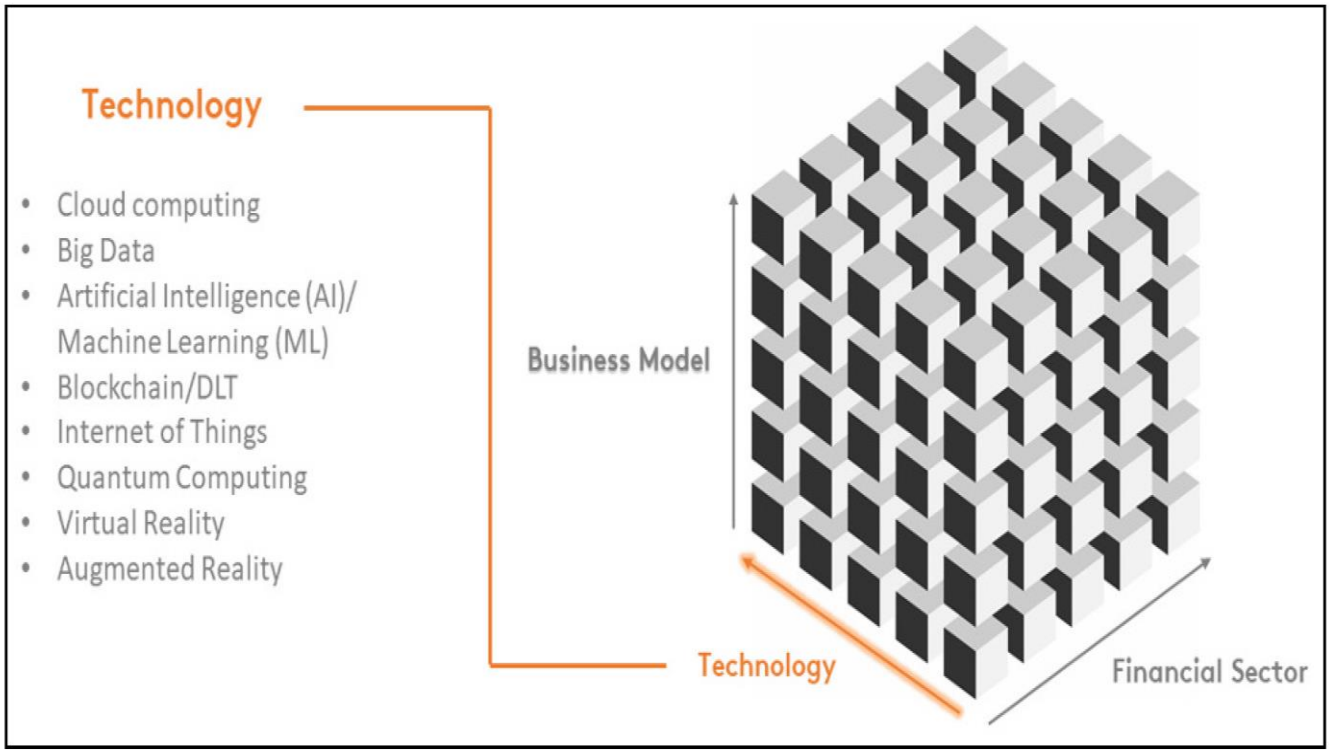
The Fintech Cube: The Financial Sector on the X-axis



The Fintech Cube: The Business Model on the Y-axis



The Fintech Cube: The Technology on the Z-axis

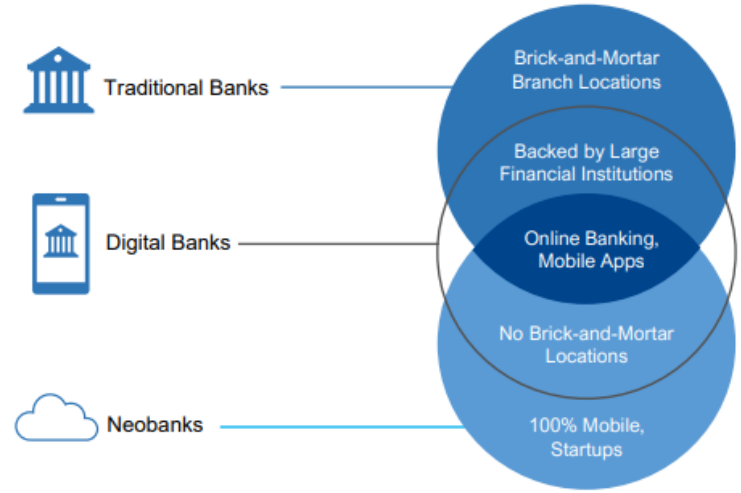


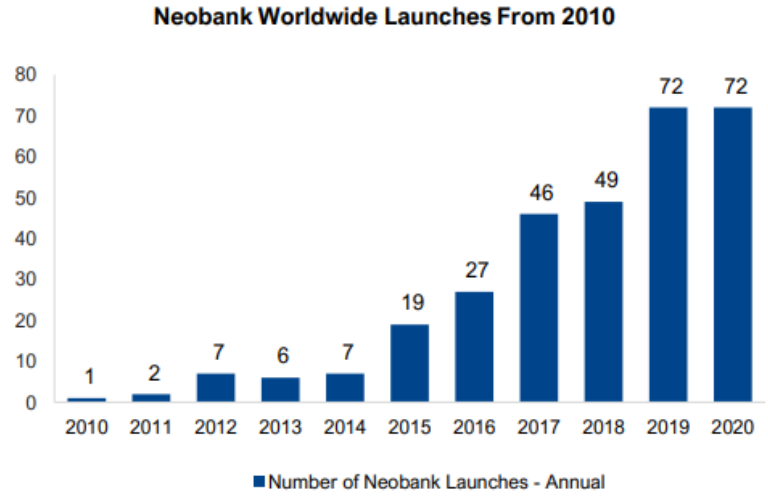
Why are Neobanks so Popular as a Fintech company?

- Neobanks are **Fintech companies** that provide standard commercial banking services entirely digitally. Unlike conventional banks, Neobanks do not have their usual bank branches and, importantly, are not licensed as banks. Neobanks began to develop recently but have already managed to win a large client base.

- An Amazon bestselling author and Founder of Neobank Moven, Brett King, once said, “At 2030, I would say that you probably have two billion people that will be using day-to-day banking services, independent of banks”.

- And this shift in focus is obvious. It’s all about their wider functionality and accessibility. They also use reliable ways to attract new customers.

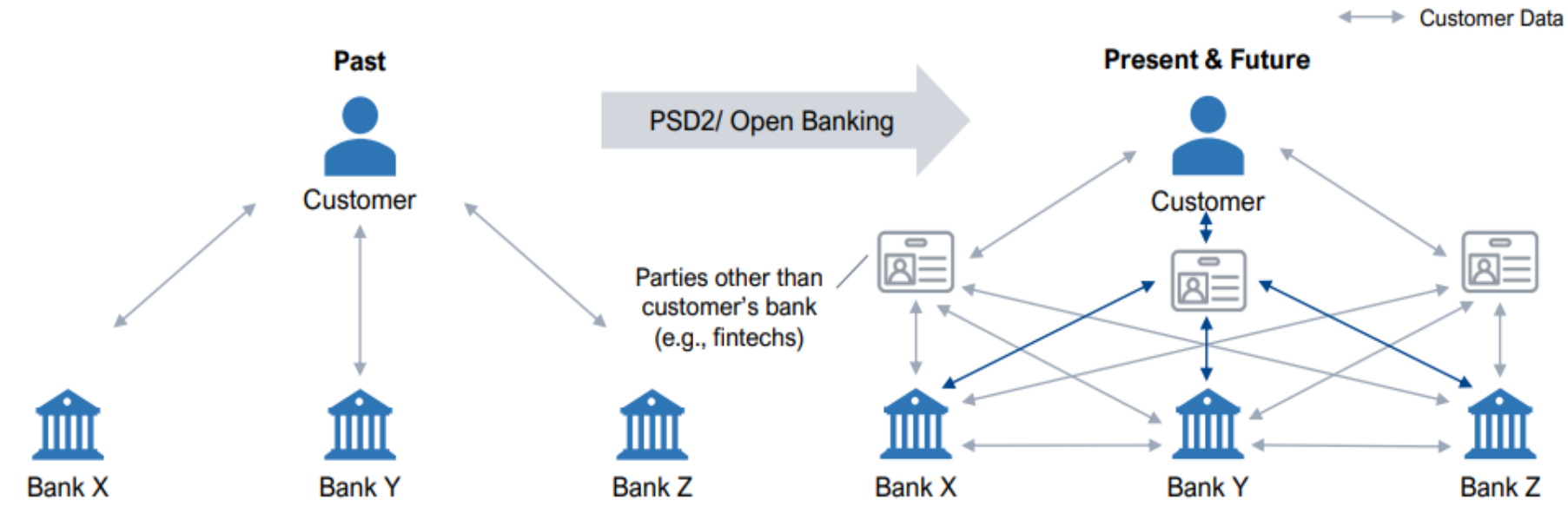




Source: Statista, Aranca Analysis

Evolution of Global Neobanking Landscape

Neobanks provide flexibility to customers and create a more competitive landscape.

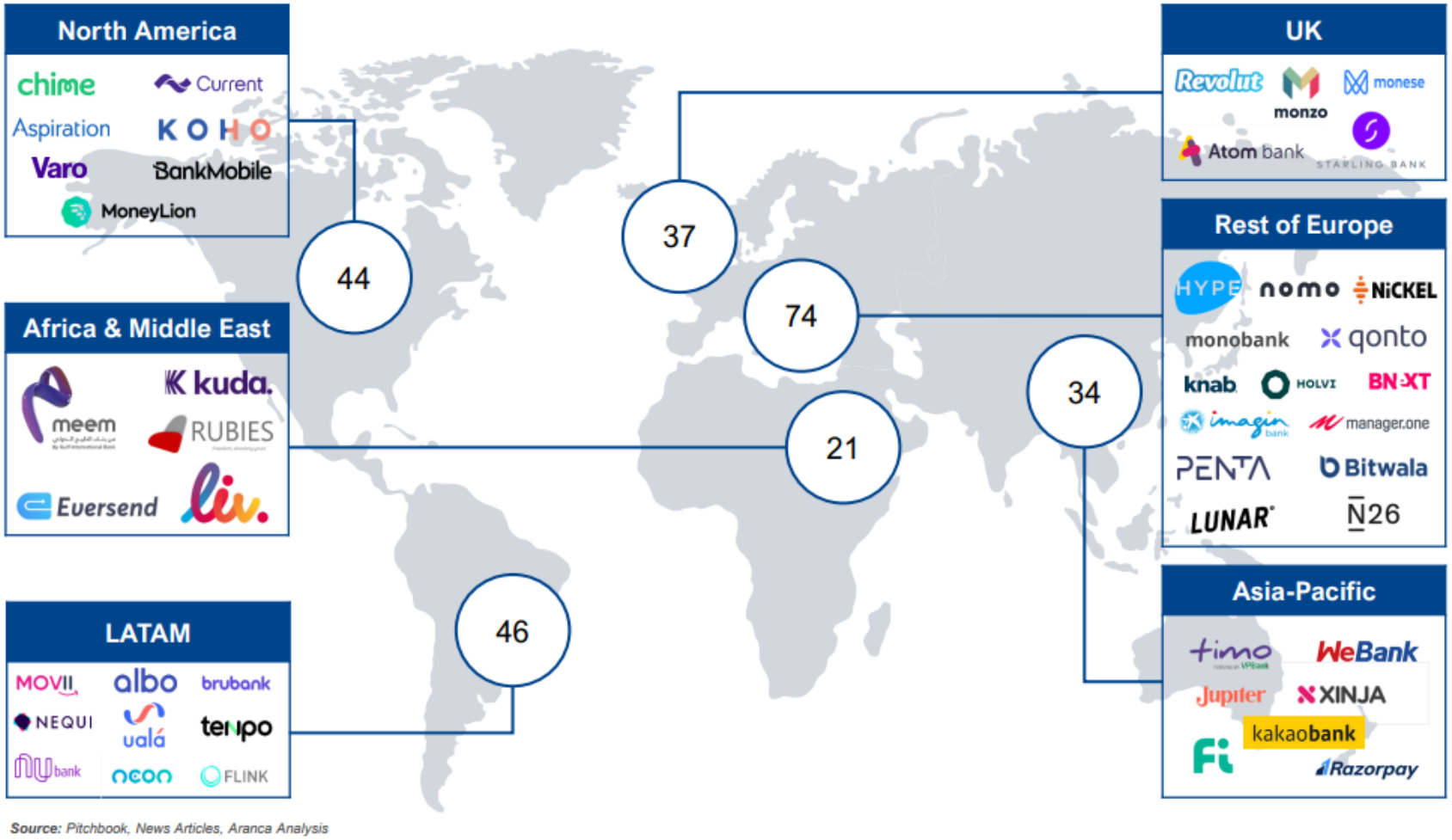


Banks own customer relationships because their apps/e-banks and branches are the only ways to access their services.

Banks provide access to their core services through third-party channels using APIs, enabling much greater transparency and allowing non-banks to compete.

***Source**: News Articles, McKinsey, Aranca Analysis*
***Note**: PSD2 is a European regulation for electronic payment services*

Neobanks Overview Worldwide



Source: Pitchbook, News Articles, Aranca Analysis

What's the Difference Between Neobank and Bank?

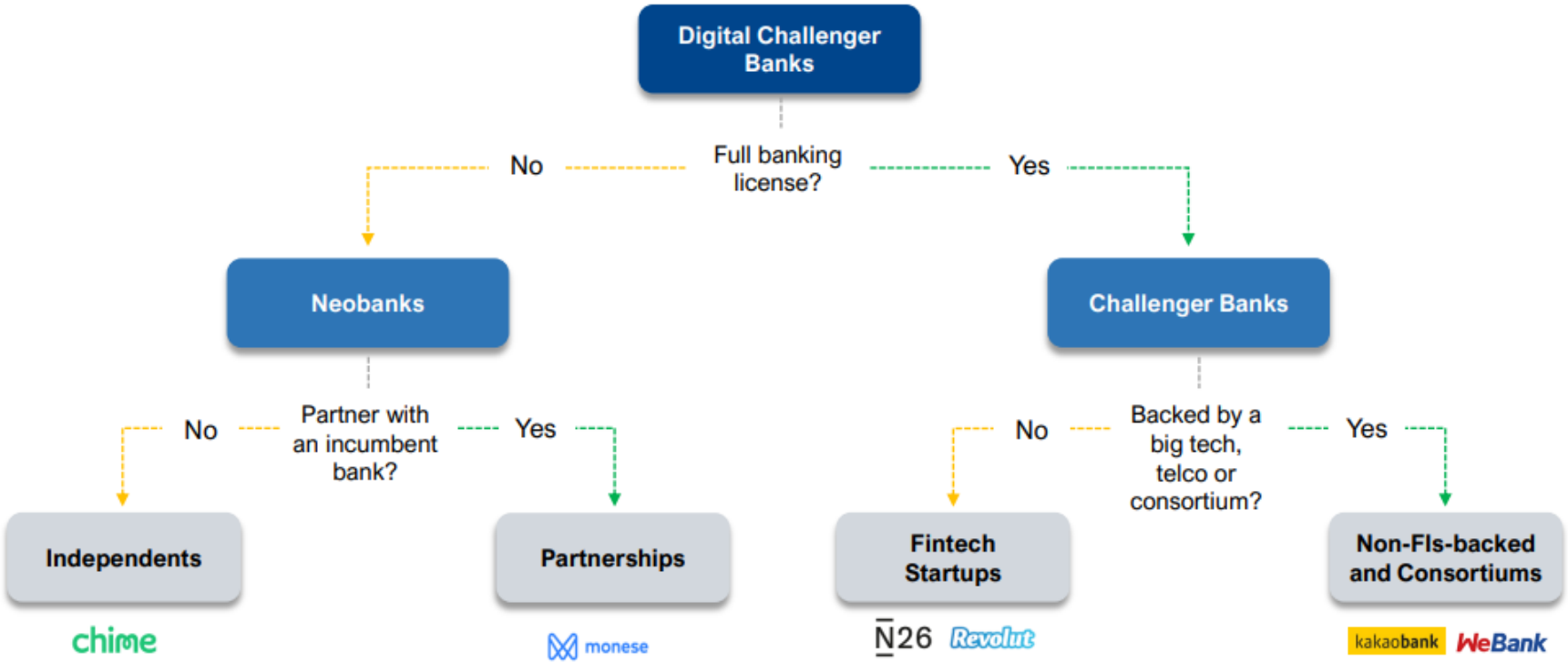
- The principal difference between Neobank and a traditional bank is that Neobank does not have physically existing offices where you can come to take a loan or open a current account. Everything can be done through an application on your phone or website.

- However, there are other significant differences between organizations:
  - ✓ Neobanks do not provide many services, but they promise to develop and expand the range of services.
  - ✓ The regulator for ordinary banks is the Central Bank, but for Neobanks there are two regulators – the Ministry of Finance and the Central Bank.
  - ✓ Regular lending institutions can only work with full bank accreditation, while Neobank can have both payment and financial accreditation, depending on the services provided.

- It is interesting that today Neobank and classical bank concepts are combined. The latter go online, become active in the digital space, and Neobanks, without offices, install ATMs or small representative offices based on partner organizations, so the differences are becoming smaller.

Types of Neobanks

- Globally, there are three types of neobanks based on payments, experience, and credit. The first type makes payments faster, the second makes banking simpler, and the third offers flexible, convenient, and affordable credit.



A Short History of Direct Banking Models

1990_____2000_____2010_____Today_____

First generation direct banks	Second generation direct banks	Neobanks
• Starting point in the 90's – peak before the dotcom bubble • Call Center as pivotal point of the business Model • In most cases affiliated with one of the incumbent banks • • No long-term economic success	• Launched as direct alternative to traditional banks • Strong growth in the 2000s – reaching scale through acquisitions (e.g. ING DiBa) or organically (e.g. DKB) • Focus on Online (desktop) and process automation (cost reduction!) • Different types of direct banks emerging: brokerage specialist, savings monolines, or primary banking alternatives to branch banks	Five common identifiers for Neobanks: • Disrupting a specific segment, product or process • Extreme focus on customer experience and "journeys" • Smartphone as primary distribution and communication channel • Based on new, flexible IT-architecture – no "Legacy" • API-Native and Open Banking oriented

Overview of Full-stack and Front-end Neobanks

Full-stack Neo Banks	Features
• Built on Platform model • Have a banking license • Control most of the value chain from front-end to back-end • Use a lean/asset-light approach • Have their own/proprietary CBS • Leverage unsoiled data to gain customerinsights/offer personalized services	**Asset-light platform** N26; Starling Banks; Monzo **Full Services (in-house)** Atom bank; Tandem

Front-end Focused Neo Banks	Features	
• Do not have a banking license • Partner with a larger/established bank • CBS/tech systems are off-the-shelf or sourced externally • Control only front-end of the value chain (customer interface) • Support B2C and B2B apps • Target niche segments (young millennials, SMBs, Entrepreneurs)	**B2C**	**B2N**
	Targets young people	**SMB Focus**
	Osper; Loot	Qonto; Revolut
	Basic Banking Services	**Solo Entrepreneur**
	Revolut; Compte Nickel; Monese	Holvi; N26; Kontist

Why is Neobank the Best Option for Users in 2022?

- The advantage of Neobanks is to minimize costs, which increases the speed of service, low tariffs are applied, a personal approach to clients is used. Advantages of using Neobanks for users include:

  - ✓ the clients can use Neobank services in any place convenient for them (at home, in the office, in a traffic jam, etc.)
  - ✓ the clients can use Neobank services from any digital medium (tablet, phone, laptop, PC)
  - ✓ the clients don’t need to wait in line in matters of work
  - ✓ quick and easy control over the state of the account online
  - ✓ obtaining advice from bank specialists at any convenient time, wherever customers are
  - ✓ Confidentiality
  - ✓ availability

Why is Neobank the Best Option for Users in 2022?

- Neobanks provide almost the same services as ordinary banks:

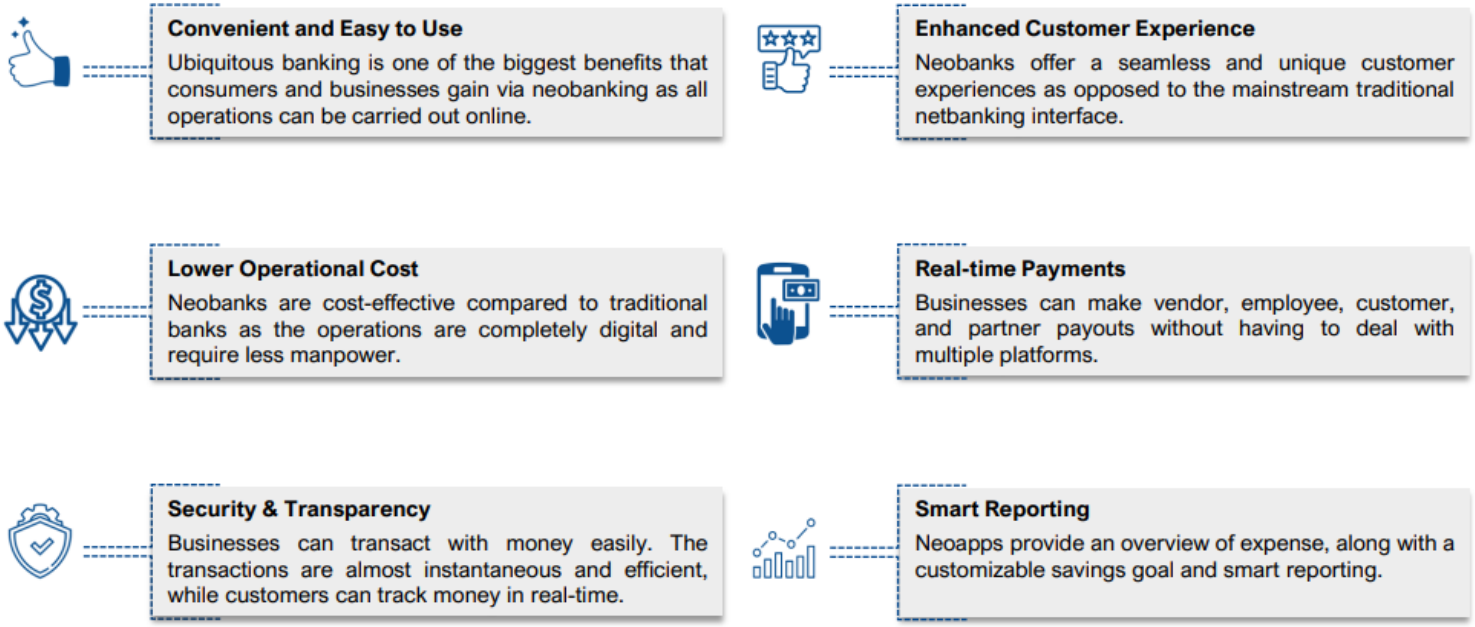
  - ✓ accounts and operations on them
  - ✓ loans
  - ✓ wealth management
  - ✓ investments
  - ✓ deposits, etc.

In addition, the majority also use modern formats: financial advisory robots, crowdfunding platforms, and cryptocurrencies.

The scope of Neobanking services and activities in individual countries depends on the level of their economic and technological advancement, the legislation in force, and the degree of maturity of the banking system.

Why You Should Start NeoBank, Some of the Strategic business Advantages

- You are more competitive than banks
- More benefits for the customer
- Still “Blue Ocean”
- Investment attractive projects



What are the Trends of Neobanks in 2022-25?

- To create an excellent and high-quality Neobank, you need to be aware of the trends in this field. Let's take a closer look at the Neobank trends for 2022-2025:

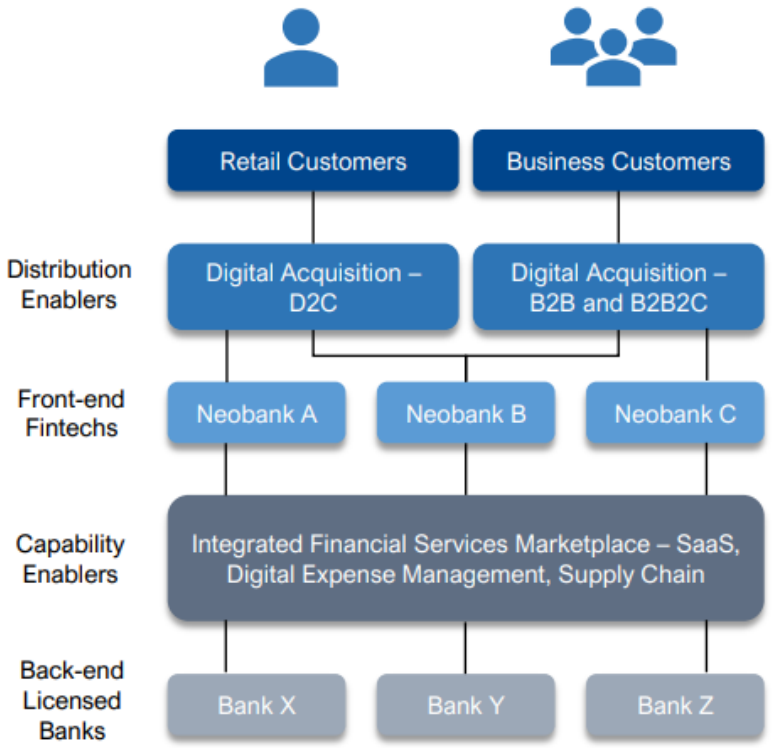
  - ✓ Artificial Intelligence and Adaptive Machine Learning
  - ✓ Transparent financial services
  - ✓ Improving knowledge in the field of financial technologies
  - ✓ Cybersecurity in financial institutions

Operations overview (1/2)
Neobanks thrive by disrupting banking system…

- **Pure-play Neobanks** – These include neobanks that are mainly digital in terms of core banking operations and customer-facing models, and that offer core banking and other value-added services.

- **Incumbent Digital Subsidiaries** – These include existing traditional banks that started with a brick-and-mortar approach and have invested significantly to transform into a click-and-mortar model.

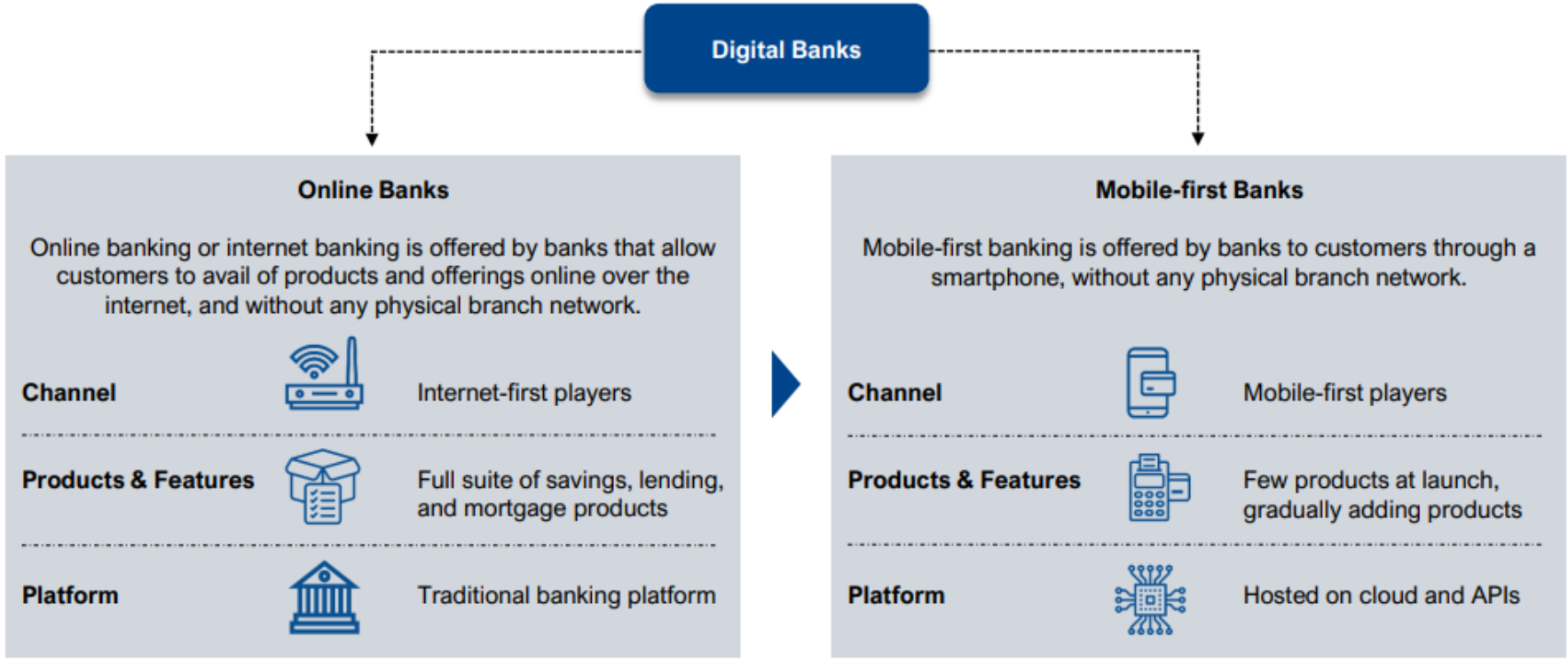
- **Hybrid Banks** – These include a combination of the brick-and-mortar physical banking approach and virtual banking. This type primarily uses digitization as a means to offer banking products at lower costs without compromising quality.



Operations Overview (2/2)
…With Their Customer-Centric Digital Offerings

Diversified Financial Products on Digital Platform	• Deposits (CASA and Term) • Payments and Remittances • Accounts and Account Aggregation • Investments and Robo Advisors • Lending and Cards • Rewards and Loyalty Programs
Digital Onboarding	• e-KYC • e-Signature • Aadhar-based Authentication • Account Aggregator Linkages
Digital Servicing and Engagement	• Intuitive App • Chatbots • Virtual RMs and Call Centers • Contextualized User Experience
Focus Segments	• Millennials • Gen Z • Enterprises (especially SMEs) • Other Retail Customers
Partnerships	• Banks (X,Y,Z) to provide bank-like products / services, especially sourcing of deposits • Lending partnerships with banks, NBFCs, fintechs • Partnerships with insurance and wealth management platforms • Partnerships with platform enhancers and solution providers (e.g., gateway)
Licenses and Regulation	• Bank Licenses – as per Regulations • Broking and Agency Licenses • Remittance Licenses

React and Respond; From Bricks to Clicks



Source: BCG, Aranca Analysis

Key Trends Influencing the Neobanking Industry

Increasing competition – Over 250 neobanks have been launched to date. Incumbent banks, which are waking up to the threat of digitization, are raising the bar for successful and differentiated services being offered by neobanks.

Coming of age – As neobanks are increasingly becoming an integral part of the ecosystem, reaching their definition of scale (several million customers) and subsequently achieving breakeven, investors are anticipating a shift from cash burn to monetization.

Stricter regulatory scrutiny – Neobanks have emerged as an institution of aid for the banking sector and financial services industry at large and are no longer considered as rookie banks.

Increased complexity within multinational banks – Banks have started to realize the difficulties associated with competing on multiple fronts and dividing management attention between them.

COVID-19 changing the parameters of retail banking across the globe – Rising credit defaults, increased customer willingness to shift to digital payments, lockdown-induced restrictions and increase in non-performing loans, especially consumer loans, are some of the impacts of the pandemic.

Source: *Exton Consulting, Aranca Analysis*

Top Neobank Development Problems, Mistakes and Challenges

❑ Top Development Problems and Mistakes

- ✓ Lack of focus on the audience
- ✓ Lack of ideas behind
- ✓ Poor analysis of the market and competitors
- ✓ Bad user experience
- ✓ Start without MVP
- ✓ Lack of experience in the team

❑ Top Development Challenges

- ✓ Security
- ✓ KYC
- ✓ Two-factor authentication
- ✓ Fast Payment
- ✓ Regulations
- ✓ Good integration

How to Start a Neobank: Must-Have Features

- How to start a Neobank that will meet all the expectations and requirements of users? To make it easier for you to understand what are the best features to add to your Neobank, here is a list of must-have Neobank features in 2022:

  - ✓ Onboarding
  - ✓ Authorization
  - ✓ Personal account management
  - ✓ Customer support
  - ✓ Transaction history
  - ✓ Internet limits
  - ✓ Payment templates
  - ✓ Contact database synchronization
  - ✓ Credit lines
  - ✓ Notification and reminder system

How to Start a Neobank: Advanced Features in 2022

- If you want your Neobank to be more advanced and different from others, add advanced features to it. Here is a list of such features:

  - ✓ Cashback
  - ✓ Dynamic CVV2
  - ✓ Cost tracking
  - ✓ Referral system
  - ✓ Accumulation system
  - ✓ Stocks and cryptocurrencies

Part 3: How to Start a Neobank; Step-by-Step Guide to Architecting a Neobank

Contents Overview:

- ❑ Neobank Business Models Known to be Effective
- ❑ Path for Stable Profitability for Neobanks
- ❑ Step-by-Step Guide to Architecting a Neobank
- ❑ Start NeoBank Development Process Life Cycle
- ❑ A Sample of an Acceptable Technology Stack in 2022 for Neobanks
- ❑ Microservices Architecture in Banking and Underlying Principles
- ❑ Advantages of Microservices Architecture in Banking
- ❑ How Monzo Created a Digital Bank on Microservices
- ❑ A Guide to Building a Digital Bank; Layered Architecture
- ❑ Open Banking Architecture

How do Neobanks Make Money? Neobank Business Models Known to be Effective

- There are five leading neobank business models known to be effective:

  - ✓ Interchange-led
  - ✓ Credit-led business model
  - ✓ Ecosystem-led business model
  - ✓ Asset-led business model
  - ✓ Product extensions

How to Make a Neobank Profitable? Path for Stable Profitability

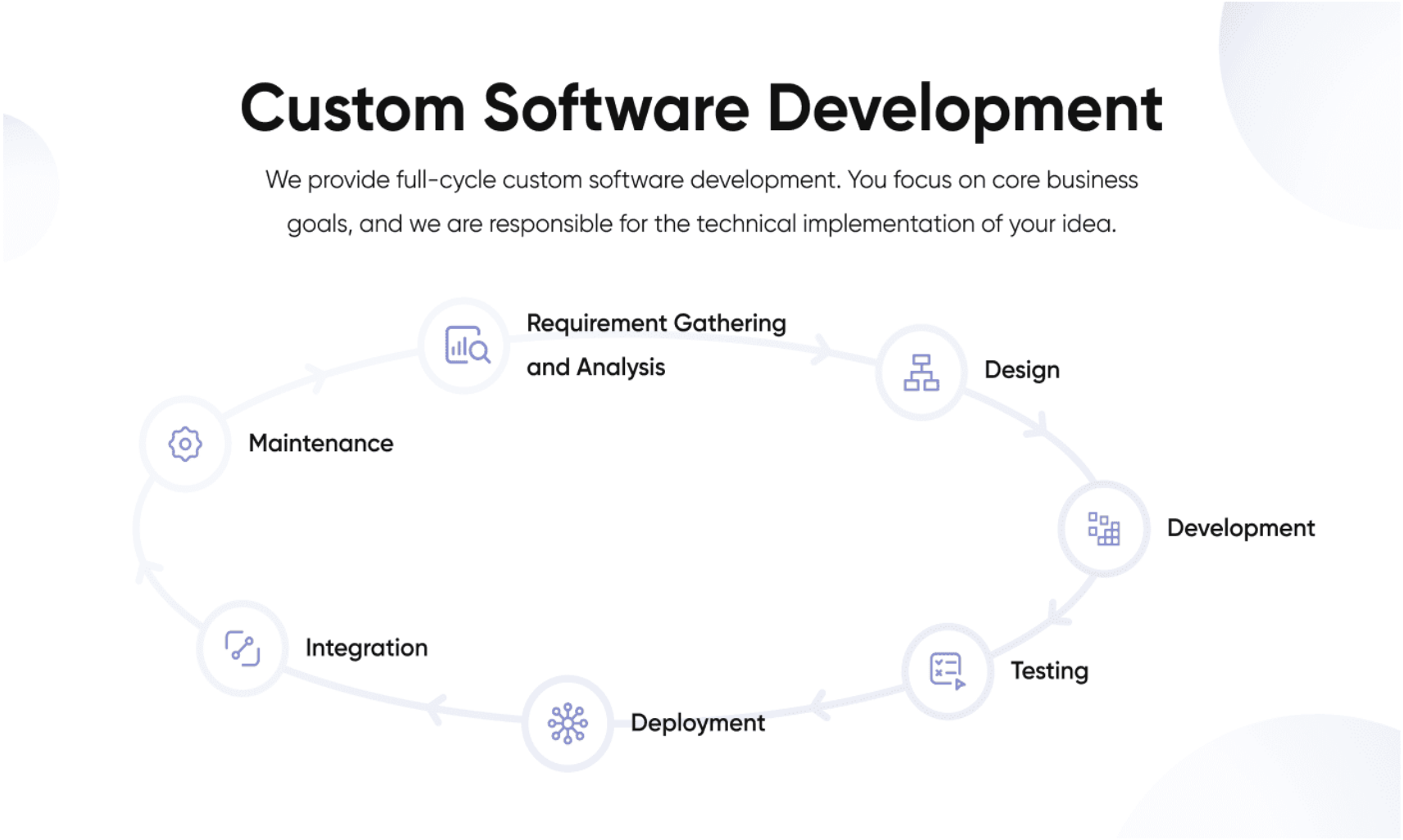
- The lack of trust from customers. The aforementioned customers' frequent reluctance to choose a neobank as their primary bank is a clear demonstration of that. This leads to the situation when it's difficult for neobanks to build long-term relations with customers, raise the volume of customers' deposits and interaction ratios.

- Incumbent banks are catching up with their digitalization strategies. Recently, traditional banks have started heavily investing in improving their IT infrastructure, so sometimes it's difficult to compete with them, even for the most profitable neobank business models. The pandemic only accelerated banks' aspirations to win this digital race, as many branches have been closed due to the COVID restrictions.

- The threat of Big Tech (Apple, Google, and others) venturing into banking. Companies like Apple offer the same commodity services (like payments, debit cards, credit cards) as the neobanks, and provide the same type of advantages (with regards to a digital, simple, and fluent offering) – this threat might actually be bigger for neobanks than for incumbent banks.

Step-by-Step Guide to Architecting a Neobank [Development Process]

Start NeoBank Development Life Cycle



Neobank Development: A Sample of an Acceptable Technology Stack in 2022

What tech stacks are best for Neobank development? Here is a sample of an acceptable technology stack In 2022:

- For IOS Development
  - ✓ Kotlin
  - ✓ Swift
  - ✓ React Native
- For Android Development
  - ✓ Java
  - ✓ Kotlin
  - ✓ React Native
- Cross-Platform Development
  - ✓ Flutter
  - ✓ React Native
  - ✓ Xamarin

Microservices Architecture in Banking: The Underlying Microservices Architecture Principles

- The underlying microservices architecture principles are:

  - ✓ It is possible to develop services using different technologies that involve programming languages, frameworks, and databases.
  - ✓ Each service can be built, deployed, managed, and scaled independently. Therefore, there is no need to upgrade or rewrite the whole banking system when introducing new functionality or minor changes.
  - ✓ If software experts extend a component service, making it more complex, they can divide it into smaller services to improve scalability and maintenance.

Microservices Architecture in Banking: What Advantages Will Your Company Get?

- Top advantages of a microservices architecture in banking are:

  - ✓ Scalability
  - ✓ High availability and fault tolerance
  - ✓ Ease of maintenance
  - ✓ Improved security and compliance
  - ✓ Facilitated deployment
  - ✓ The flexibility in using different technology stacks

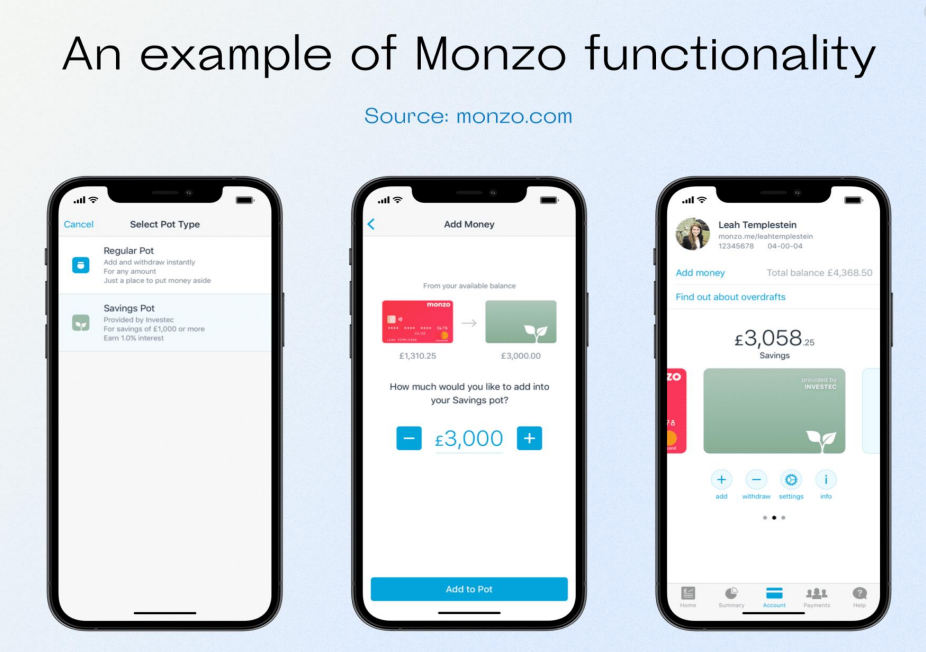
How Monzo created a digital bank on microservices

- Based in the UK, Monzo is an online bank platform and marketplace that provides customers with access to a variety of financial products and services. Established in 2015, the startup managed to raise $648.1 million over 20 rounds. As of 2020, Monzo had more than 4 million customers with $1.38 billion in transactions so far.

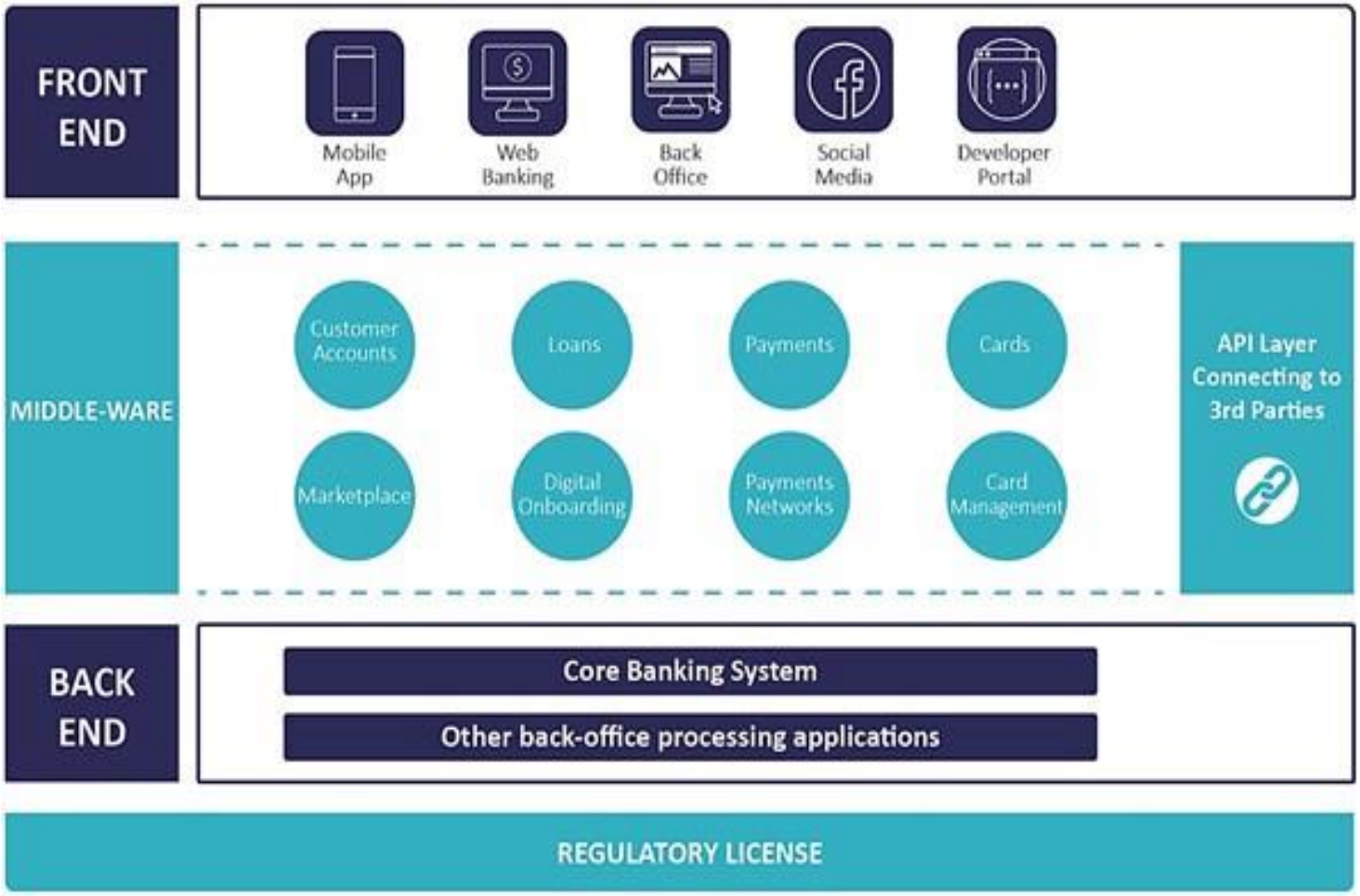
- From the very beginning, the company's goal was to develop a highly available, fault-tolerant, and responsive infrastructure while ensuring a seamless user experience. Monzo saw that consumers often experienced delays in accessing services or carrying out operations. For instance, users could now view their balances in real time as transactions could take 48 hours to be displayed in client statements.

How Monzo Created a Digital Bank on Microservices

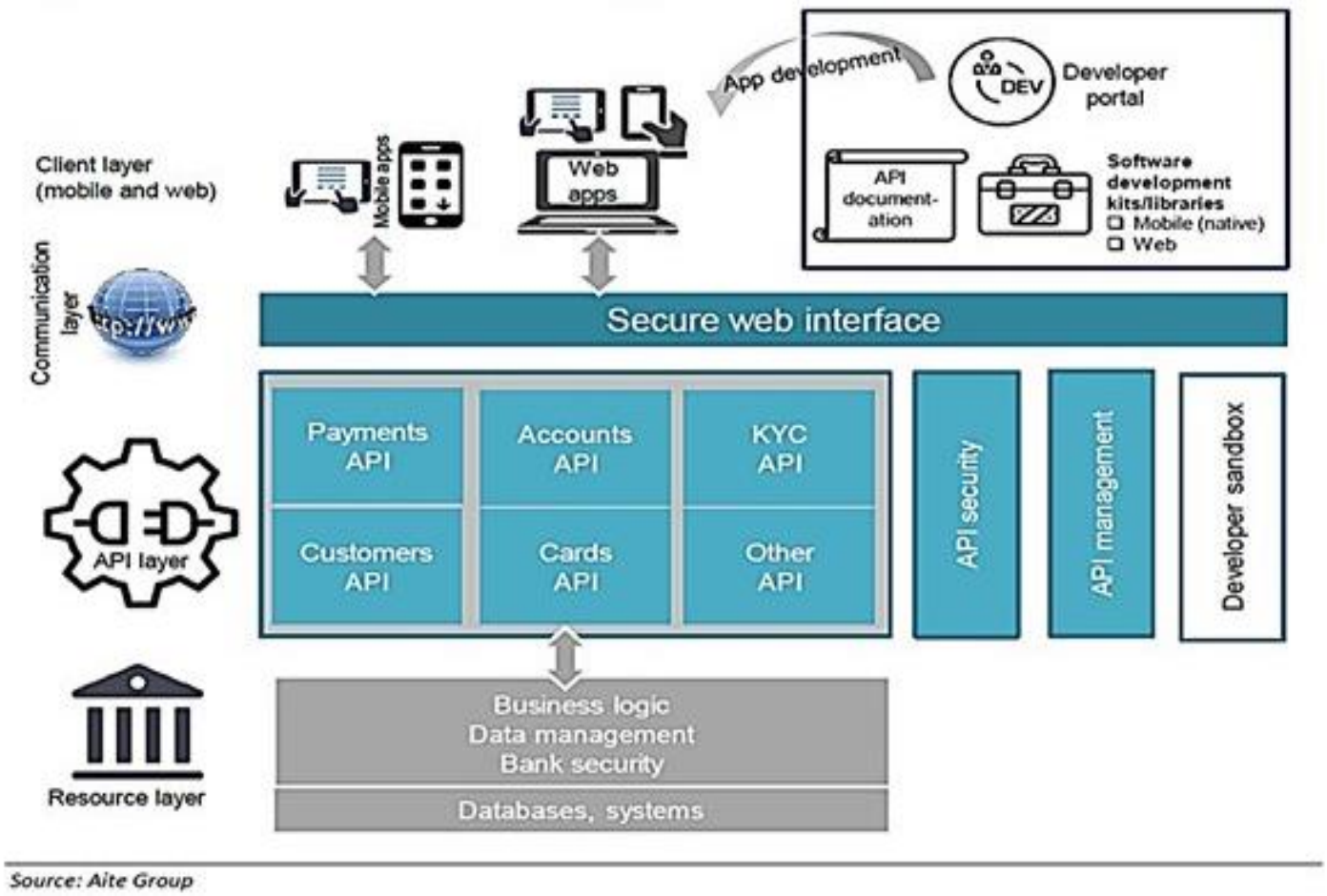
- To deliver scalability, resilience, and performance while minimizing delays, Monzo built a microservice architecture solution using AWS for its core banking system architecture. Employing Kubernetes for app deployment and containerization, the organization achieved better agility and fault tolerance. At the moment, Monzo runs 1600+ microservices on AWS.



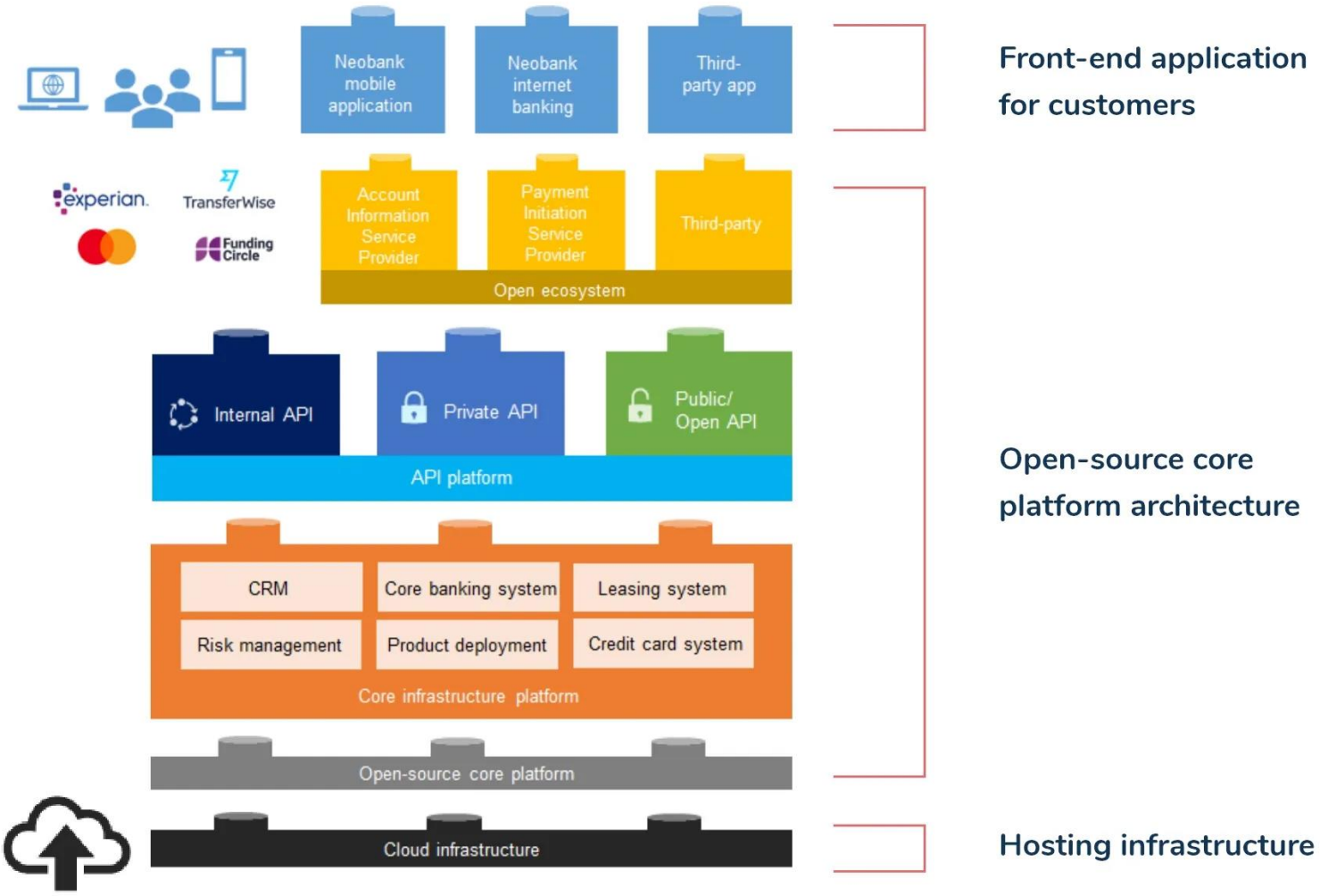
A Sample Layered Architecture of a Digital Bank



A Sample of Open Banking Architecture



A Sample of Neobank Architecture



A Summary of How to Start a Neobank

- Corporations develop ecosystems, and this is the greatest area for Neobanks to fit. Neobanking is a much more promising field now. One of the most hotly debated topics in the FinTech sector today is how to start a Neobank and integrate it into a larger ecosystem.

- Summing up all of the above, we can highlight the main points that you should pay attention to during the development of Neobank:

  - ✓ Conduct market and competitor research
  - ✓ Focus on user experience
  - ✓ Know the risks and challenges ahead of time
  - ✓ Don’t neglect to describe your idea
  - ✓ Choose your project team carefully
  - ✓ Stick to the plan

Part 4: Neobank Technology; Deciphering Architectures of the Top Banking Apps

Contents Overview:

- ❑ Techstack Behind Success Stories of the Top Neobanks
- ❑ Microservice architecture as basis of a modern bank back end – based on Monzo experience
- ❑ Migration to improve engineering productivity — how Chime moved to AWS
- ❑ Fast-paced growth with Google Cloud Platform — Revolut experience
- ❑ Scaling without sacrificing quality — how Nubank switched to Flutter
- ❑ How Tinkoff built a chatbot to improve customer experience
- ❑ Test automation for banking apps
- ❑ Summing Up

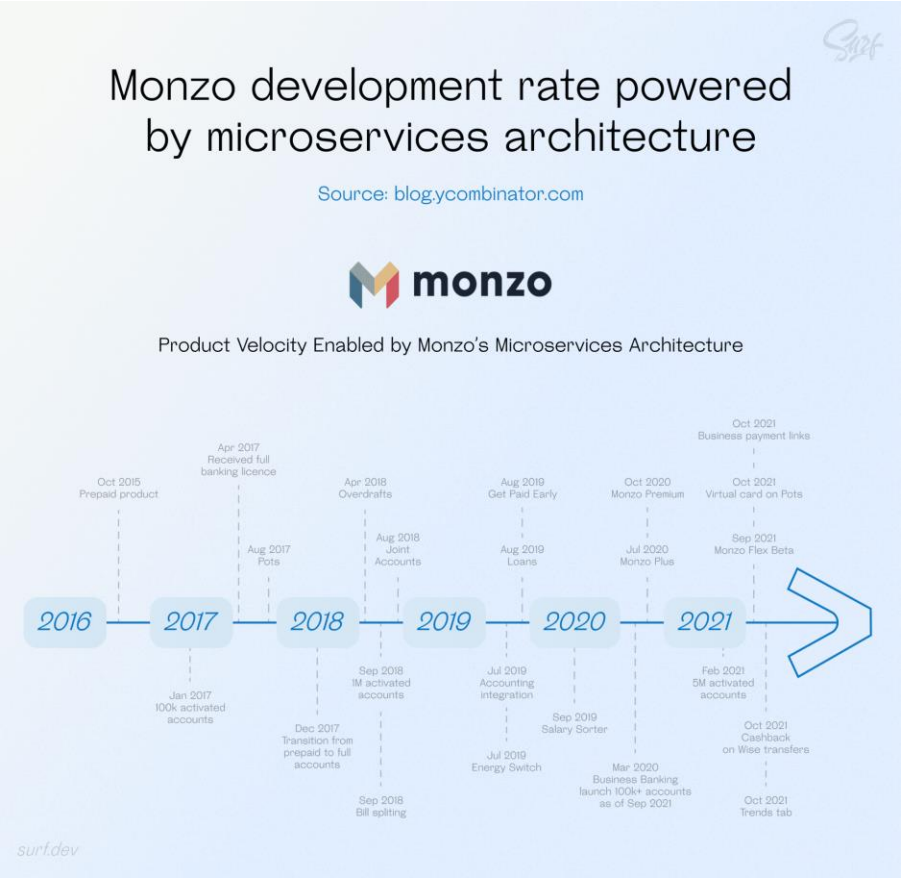
Techstack Behind Success Stories of the Top Neobanks: Microservice Architecture

Microservice architecture as basis of a modern bank back end – based on Monzo experience:

- Founders of Monzo bank initially planned to build a system with the best technology that would offer the best current account and business bank accounts. And what is more, the system had to be scalable to support the needs of millions of customers.

Techstack Behind Success Stories of the Top Neobanks: Microservice Architecture

- From the examples of large companies like Amazon, Netflix, and Twitter, they knew that a single monolithic codebase does not allow easy scaling.
- So, the Monzo team chose to build a back end as a collection of distributed microservices. The solution was not typical for an early-stage startup. But the company succeeded in creating a product that can be changed anytime in the future.

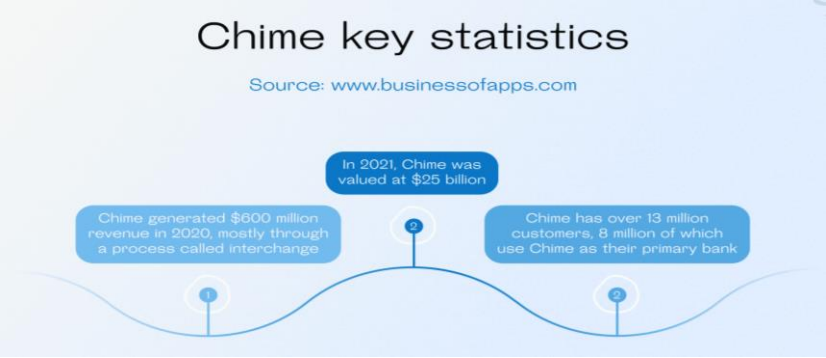


Techstack Behind Success Stories of the Top Neobanks: Migration to Improve Engineering Productivity

Migration to improve engineering productivity — how **Chime** moved to AWS:

- Before the migration to Amazon Web Services (AWS), Chime was hosted in a vendor-managed data center. With the growth of the services and member base, the company realized the need for an infrastructure that could be scaled fast and would be resilient to ensure the required availability. As the Chime team position themselves as member-obsessed and work hard on providing better services, reliable data, and security. That's why they saw the **migration to AWS** as a great opportunity to achieve the goals mentioned. The migration started in 2019 and was completed in 2021.

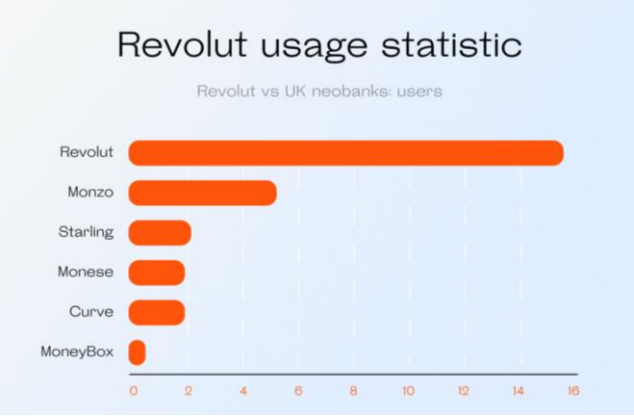
- AWS offers a lot of services covering databases, caching, messaging, deployment infrastructure, and more. Mike Barrett, VP of Engineering Services at Chime said: "By making every part of engineers' jobs a little—or a lot—easier, Amazon Web Services (AWS) helps companies like Chime focus on their core competencies and deliver better products and services."



Techstack Behind Success Stories of the top Neobanks: Fast-Paced Growth With Google Cloud Platform — Revolut Experience

- Another successful example presents Revolut, launched in 2015. As the company extended in terms of functionality and acquired more customers, it became clear their initial cloud-based solution could not support their rapid growth. They needed an infrastructure that would allow automating deployments, while maintaining stability and security.

- The company decided on **Google Cloud Platform** for its new infrastructure. The key advantage of the platform is that it is simple and intuitive. Google Cloud allows automating deployment multiple times a day with Compute Engine and Google Cloud application programming interfaces (APIs), maintaining resilience due to incremental snapshotting and security with easy segregation using Cloud Identity and Access Management.

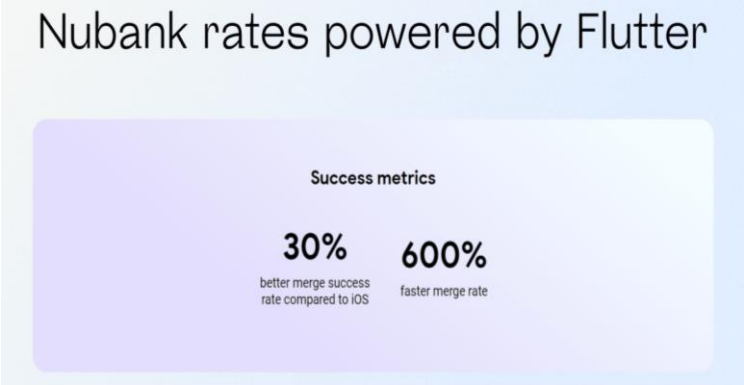


Techstack Behind Success Stories of the top Neobanks: Scaling Without Sacrificing Quality — How Nubank Switched to Flutter

- Nubank grew extremely rapidly and faced the lack of native mobile specialists to release new products quickly and simultaneously for iOS and Android platforms. That's why the company decided to **switch to a cross-platform technology** to deliver value on a single architecture and programming language and to keep up with their ambitions for shipping new products.

- The choice of Nubank was **Flutter** as it outperformed other platforms in terms of the pre-specified criteria: Flutter offered better hot reload abilities and strong documentation.

- Noe Branagan, Engineering Manager, Nubank, said: "Having Flutter as our main technology has significantly reduced the barrier, allowing new engineers to be able to contribute to our app within days after being onboarded." As a result, the performance has significantly improved.



Techstack behind success stories of the top neobanks: Scaling Without Sacrificing Quality — How Nubank Switched to Flutter

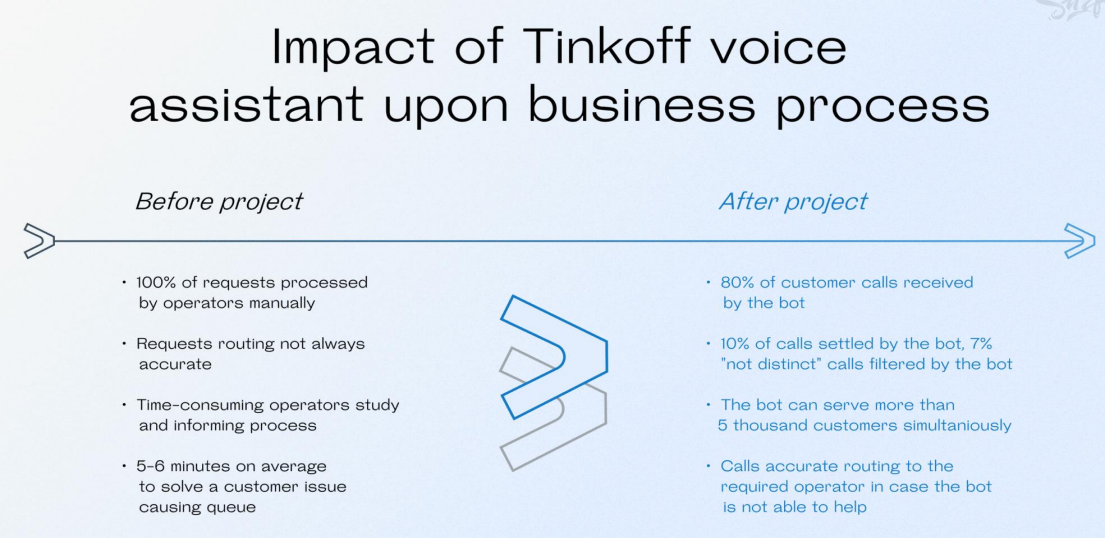
- Here are some of the benefits Flutter offers for the banking domain:

  - ✓ faster time to market
  - ✓ possibility to optimize expenses: an in-house team of Flutter developers requires fewer costs than two native teams
  - ✓ the single codebase, which provides for easier testing and debugging
  - ✓ Flutter-powered apps are easy to maintain, scale, and develop
  - ✓ users see practically no difference from native apps: smooth animations, system-specific interface elements, gestures
  - ✓ security: Dart code is compiled into native code that is not human-readable. It complicates reverse engineering and improves security compared to Java, Kotlin, or React Native projects

How Tinkoff Built a Chatbot to Improve Customer Experience

- Neobanks are customer-focused: the technologies to power the front end are no less important than reliable security, continuous deployment, or forward-looking architecture. Banks employ new technologies such as biometry, chatbots, and AI to add value to their model of remote customer relationships.

- One of the popular trends in banking is chatbots. NMSC reports that the value of the global chatbot in the banking, financial services, and insurance (BFSI) market is forecast to increase to 6.83 billion U.S. dollars by 2030 from 586 million U.S. dollars in 2019.

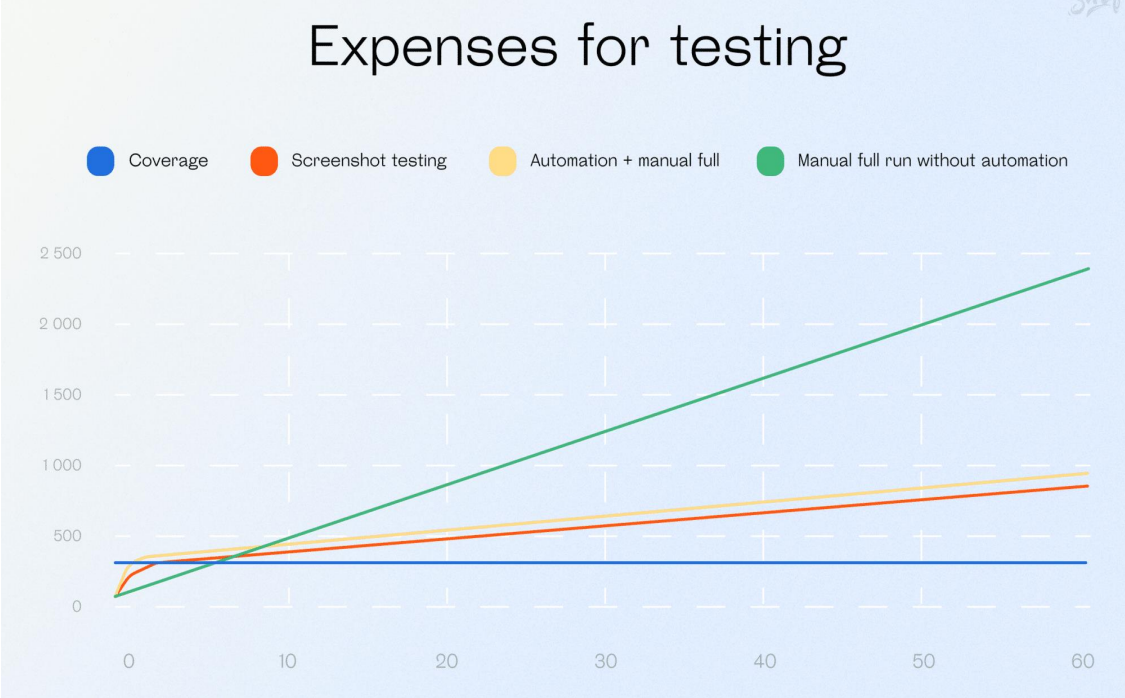


How Tinkoff Built a Chatbot to Improve Customer Experience

- Banks and financial institutions deal with customers' sensitive information and have always attracted fraudsters ready to use any gaps or weaknesses in the products. Therefore, many banking apps face a lot of security concerns, and testing shall receive special attention when we speak about financial services.

Techstack Behind Success Stories of the Top Neobanks: Test Automation for Banking Apps

- Last but not least, here is the diagram that demonstrates how expenses for testing grow with time depending on the testing model.



Summing Up

- Based on experience in building neobanks, here are some significant aspects for you to pay attention to when planning to build your future product. They are:

  - ✓ flexibility both in terms of business model and technology stack
  - ✓ innovative solutions to improve customer experience
  - ✓ security due to compliance with regulation and choosing reliable partners
  - ✓ continuous automated deployment for faster releases
  - ✓ easy scalability powered by the right choice of technologies
  - ✓ test automation that allows ensuring high quality

Thank you for your attention

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