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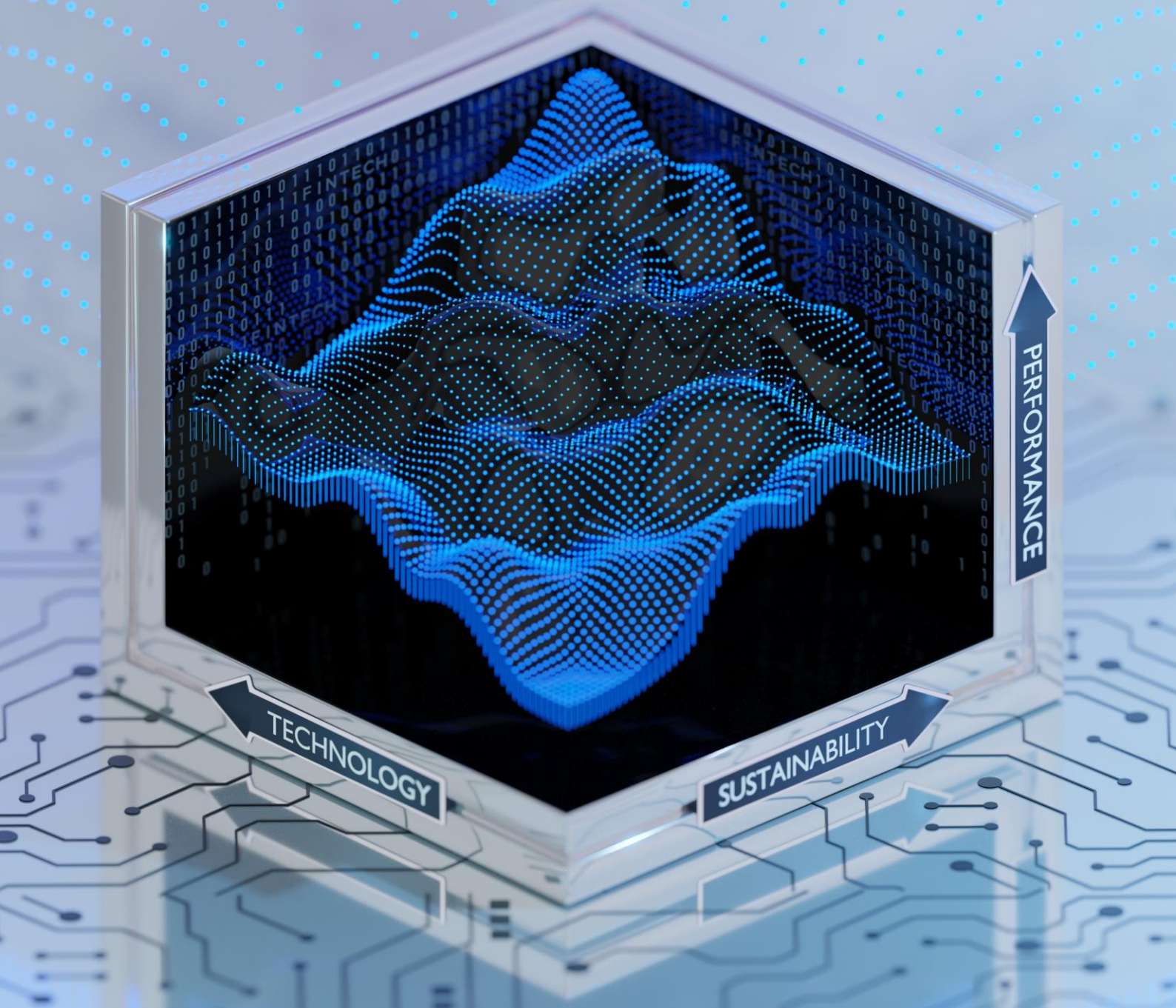

Data-driven Banking in Switzerland

Data drives the next generation of banking

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Contents

1. Introduction

The pace of development and adoption of new technologies has accelerated in recent years. Companies can no longer delay the introduction of modern technologies but must react quicker in order to be able to maintain their position in the market in the long term. Two key future technological developments that businesses will need to respond to are the increase in available data and advances in artificial intelligence (AI)[1]. Both trends have already received a lot of attention in the past years and according to several studies will continue to have a significant impact on our daily lives as well as the global economy.

According to PricewaterhouseCoopers (PwC), AI could contribute up to USD 15.7 trillion to the global economy in 2030, with USD 6.6 trillion resulting from increased productivity and USD 9.1 trillion coming from consumption side effects (PwC, 2017). Data collected by McKinsey & Company show a similar picture. The potential annual value of data analytics and AI across various industries is estimated between USD 9.5 trillion and USD 15.4 trillion, with the retail, consumer packaged goods and public and social sectors driving these values. The results also show that the banking (potential annual value of USD 1 trillion) and insurance (potential annual value of USD 1.1 trillion) industries are expected to benefit from these technological trends (McKinsey, 2020). A great future potential of AI is also confirmed by Gartner. According to their assessment, the plateau of certain AI technologies will only be reached within five to ten years. Data analytics and AI are expected to further grow and be used to also determine essential connections and insights, to help predict demand for services and to detect the changing patterns of customer behavior by analyzing data in near real-time (Gartner, 2021).

The fact that AI not only has great future potential but has already been able to gain a foothold in the financial industry internationally is shown by a survey conducted by the Cambridge Centre for Alternative Finance. Their report shows that 85 percent of financial institutions already use some forms of AI in banking (Cambridge-Centre, 2020).

However, financial institutions are not among the pioneers in the field of data analytics and AI but large technology companies such as Amazon, Apple, Google, Meta and Netflix. They have harnessed these concepts to be amongst the most valuable publicly traded companies in the world. The established financial institutions, in contrast, are lagging behind, even though they have been operating in one of the most data-intensive sectors of the economy for decades. Yet several drivers exist that drive widespread adoption of data-driven banking. A visualization of these drivers is given in Figure 1.1. First, technological developments in particular influence the use of data and corresponding analyses to generate added value for banks. Three of the most relevant technological drivers in this context are developments in cloud computing, the emergence of open financial ecosystems and the already mentioned advances in artificial intelligence (magenta layer). In addition to technological drivers, data governance and compliance with existing data- and technology-related regulations are also considered important influencing factors in the application of data-driven banking (dark green layer).[2]

Only by taking into account technological developments and the regulatory environment can the potential of data-driven value creation by financial institutions be fully exploited. Depending on the application, the added value can be generated through concrete use cases in the levers for cost reduction, risk reduction and revenue expansion (blue layer).

[1] For the purpose of this white paper, Artificial Intelligence (AI) will be understood to include Machine Learning (ML).

[2] Note that social and economic drivers can also play an important role in the implementation of data-driven banking, but are not specifically discussed in this white paper.

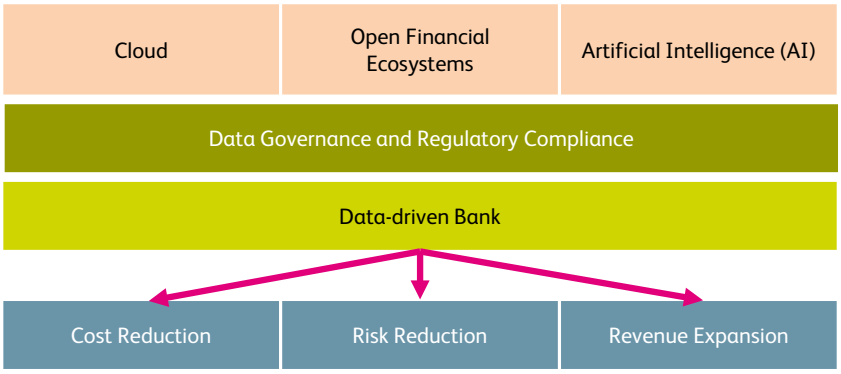

Figure 1.1: Drivers and potential of data-driven banking. Source: Own illustration

The rest of the white paper follows the layer structure in Figure 1.1. After an overview of the current state of data-driven banking in Switzerland, the aforementioned main drivers, technological and regulatory, are described in more detail. Subsequently, specific use cases for banks are derived and described for each of the levers to improve business success, i.e., cost reduction, risk reduction or revenue expansion.

2. The State of Data-driven Banking in Switzerland

The Swiss financial center is of great importance not only for the domestic economy, but also internationally. At the end of 2021, there were 239 banks in Switzerland, employing 90,577 full-time equivalents and managing assets worth CHF 8,830 billion, of which around 47 percent were attributable to foreign clients. In the area of cross-border wealth management for private clients, Switzerland is the world leader (Swiss Bankers Association, 2022). In order to maintain this position in the long term, the sector must adapt dynamically to the constantly changing environment in which it operates. Digitization, enabled by technological progress, is one of these driving forces that is having a significant impact on banking business and operating models.

There are signs that the general trend towards digitization has led to efficiency gains at Swiss banks. In particular, financial institutions were able to increase the balance sheet total and the assets under management while keeping their costs relatively stable over the last years, as shown in Figure 2.1.

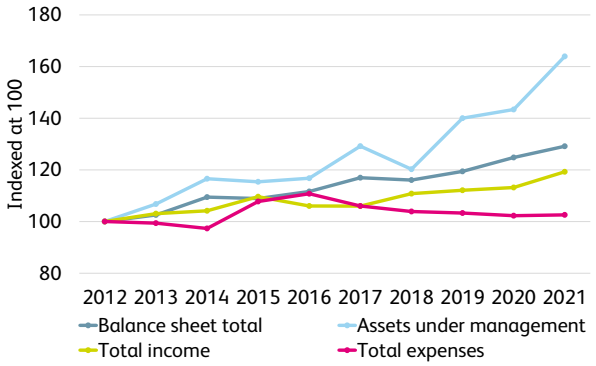

Figure 2.1: Size, costs and income indicators for Swiss banks indexed at 100. Source: SNB (2022a,b,c)

The positive development is also reflected on the revenue side, but not as clearly. This indicates that parts of the efficiency gains were passed on directly to customers. Due to the higher volumes, banks were able to absorb the decreasing margins' negative impact on their revenues. Hence, taking a look at the figures shows that Swiss banks have become more efficient over time and that the effect of digitization has materialized over the past years (Ankenbrand et al., 2022). A consistent focus on data-driven banking could further improve the position of the Swiss financial sector. For example, financial institutions could accelerate their decision-making processes and understand their customers better using data and adequate analytics. This evolution could further contribute to improved efficiency and better risk management, for example, by minimizing compliance risk and improving fraud detection. Finally, banks have the opportunity to deliver significant revenue growth by offering an enhanced personalized experience for their customers by using methodological concepts from the fields of data analytics and AI.

However, most Swiss banks have not ventured deeply into data-driven banking yet. This is despite the fact that the potential of data analytics has generally been recognized by bank representatives in Switzerland (Ankenbrand et al., 2019). Furthermore, Swiss banks assess the importance of open financial ecosystems, for example for data exchange, to increase significantly in the future (Ankenbrand et al., 2022). With the exception of hedonic models for real estate valuation, such a broad-based exchange of data across different providers hardly takes place in the Swiss financial center today, although the potential of a standardized, API-based data exchange between financial institutions would be beneficial, as it could alleviate one of the biggest challenges in data analysis, namely the availability of the required data in sufficient quantity and quality. Hence, Swiss banks seem to be aware of the important future role of data in advancing their business and operating model. The specific technological drivers of this are discussed in more detail in the following chapter.

3. Technological Drivers for a Data-driven Future in Banking

Technological developments have influenced the banking business in the past and will continue to do so in the future. The drivers explained in more detail in the following, i.e., cloud, open financial ecosystems and AI are considered to be particularly relevant for the Swiss financial industry as they enable flexible scaling, a standardized and therefore efficient form of interaction between different providers, as well as the latest methodological approaches to finding new insights in different areas of the financial domain. The fundamental resource of all three technology drivers is data, on the basis of which financial institutions can create added value for themselves and their customers.

The data available at banks can be divided into the following three main types:

- **Master data:** customer data, current and past positions, products and services, demographic, socio-economic, geographic data
- **Transaction data:** cards, payment transactions, account movements
- **Behavioral data:** interactions across different channels (digital & non-digital) such as web usage data, CRM data

Data typically needs to be pre-processed before it can be stored efficiently, shared with third parties or used for data analytics. This includes steps such as the merging of different data sources, data quality assurance, outlier detection and applying data transformations. Often, this is a labor-intensive activity, which uses a large share of the available resources in an analytics project.

The term big data is often used in connection with data at banks, as the institutions themselves have large amounts of internal data. According to Schroeck et al. (2012), big data can be broken down into the four V-dimensions volume (scale of data), velocity (speed of arrival of new data), variety (different forms of data), and veracity (different data quality). Volume is often seen as the most important dimension. The challenges of big data often lie in setting up an appropriate IT

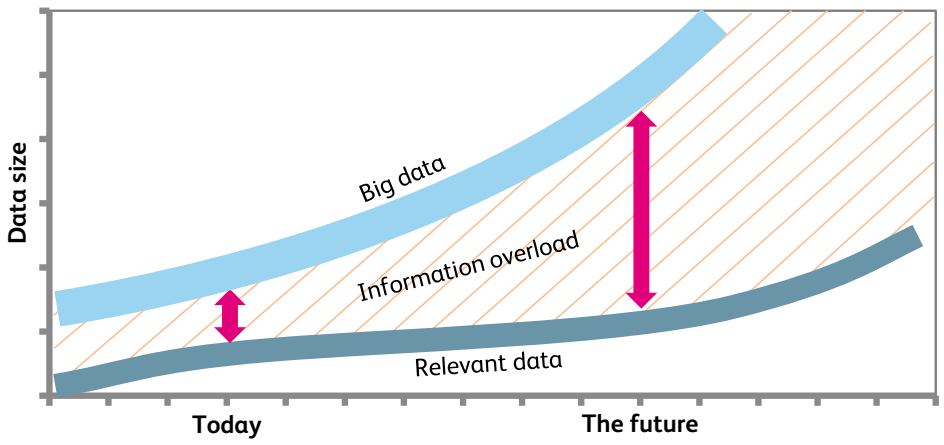

Figure 3.1: Big data and information overload. Source: Bloem et al. (2013)

infrastructure and data management system that collects and stores data from various (internal) sources and uses computational power to process the data. A key difficulty when dealing with big data is to separate noise from signal. Figure 3.1 illustrates that the proportion of irrelevant data in relation to the relevant data is expected to grow in the future as more and more data is gathered.

The three main technological drivers of data-driven banking, described in more detail in the following, can help financial institutions generate maximum value from data.

3.1. Cloud

To benefit from data-driven strategies, the data processing infrastructure must become more open and accessible to allow flexibility to integrate and scale new banking product and services. New requirements can no longer be met with the traditional on-premise model. Migrating large parts of IT services to the cloud is an integral part of any digitization strategy. The undisputed advantage of a cloud strategy also requires a comprehensive cloud governance as well as new skills, and offers the opportunity to strategically reposition the organization (Burger, 2019). Leading financial institutions such as DBS (Hire Digital, 2021) are already transforming into data-driven organizations, largely operating in the cloud.

Swiss Banks are following the trend to the cloud with caution. So far, they have been reluctant to migrate their data, especially sensitive customer data, to the cloud. However, a development can be observed regarding the shift of the operation of the less critical environments (e.g., the development environment) without customer data to the cloud, while the actual production environment continues to be hosted on-premise.

Four areas are of critical importance when it comes to migrating banking solutions to the cloud (Swiss Bankers Association, 2020a):

- Processing data on bank clients in compliance with banking secrecy
- Transparency and collaboration between institutions and cloud providers with regard to measures ordered by the authorities and the courts
- Choosing a cloud provider and its subcontractors
- Auditing the cloud services and the cloud infrastructure used to deliver them

The Swiss Bankers Association (SBA), the banks industry group, has worked with member institutions, audit firms and providers to draw up a set of guidelines for the use of cloud services and to help banks migrate their data to the cloud more easily and securely (Swiss Bankers Association, 2020a). The main reason for this was that there were legal and regulatory uncertainties that needed to be clarified in order for banks to use the cloud in a compliant manner. The working group has focused on developing a legally non-binding guide as an interpretive tool for practitioners. Uncertainties are rated as high or hindering migration to the cloud in the above four areas (i.e., governance, data processing, authorities and proceedings, audit). The clarification of the regulatory issues in the guide allows banks to act quickly and flexibly and provides pragmatic and secure solutions. Even with this guide, the assessment of the risks of migration to the cloud remains with the individual banking institutions. Therefore, each bank must decide for itself to what extent and with which provider it wants to use cloud solutions.

A representative survey of the Lucerne University of Applied Sciences and Arts, which was conducted as part of the IFZ Sourcing Study 2022 (Blattmann et al., 2022), shows reasons for and against the use of a cloud infrastructure. The main arguments in favor are the available software and functionality (71 %) and the low prices for computing and storage services due to easy scaling (43 %). However, the data storage abroad (71 %) and perceived insufficient data security (46 %) speak against it. In addition, the survey shows that for more than three quarters of banks, IT (77 %) plays the central role when it comes to moving banking services to the cloud. The management (43 %) also plays a significant role when it comes to bringing the topic of cloud into the bank. This may have something to do with the fact that cloud computing is now no longer seen merely

as a way of optimizing costs. Rather, cloud computing is becoming increasingly important as a technical component of future business and operating models. The study concludes that the time has also come for smaller and medium-sized retail banks to look into cloud computing, and that quite a few banks seem to have more or less concrete ideas or plans for shifting workload to the cloud on the table. One reason for this is that cloud computing is also becoming increasingly important in connection with open financial ecosystems (e.g., open banking), another technological trend with implications for the Swiss banking landscape.

3.2. Open Financial Ecosystems

Open financial ecosystems are a trending topic in banking and describe the leveraging of seamless API-based interactions between financial services providers, as well as non-financial firms and individuals for value creation. In general, open ecosystems can be understood as systems between interacting organizations and are enabled by modularity and complementarity properties (Hakanen, 2021), with data as the main resource. An architecture for structuring different manifestations of financial ecosystems is given in Figure 3.2.

The architecture distinguishes between five different horizontal layers. The upper two layers represent the end customer, who receives a financial product or service, as well as the providers who operate the front-end to this customer. The third layer describes those providers that are finally responsible for the execution or settlement of the financial products or services, as well as the custody of the corresponding assets, while layers four and five relate to the technological infrastructure and the handling of data by these providers.[1] In open financial ecosystems, all five horizontal layers are to some extent interconnected via an API environment (lines shown in magenta), which in turn defines the security of the system, its compliance with legal and regulatory requirements, and the certification and identification of approved parties.

Open financial ecosystems can take various forms, with the opening up of banks often being subsumed under the term “open banking”. In general, open banking represents a development in the financial services industry that allows players to share financial information electronically, securely and only under conditions that customers approve of. With regard to the architecture in Figure 3.2, application programming interfaces (APIs) allow third-party providers (TPPs) like FinTech companies to access financial information efficiently, which promotes the development of new apps and services.

[1] For more information on the architecture, see chapter six in the IFZ FinTech Study 2021 (Ankenbrand et al., 2021).

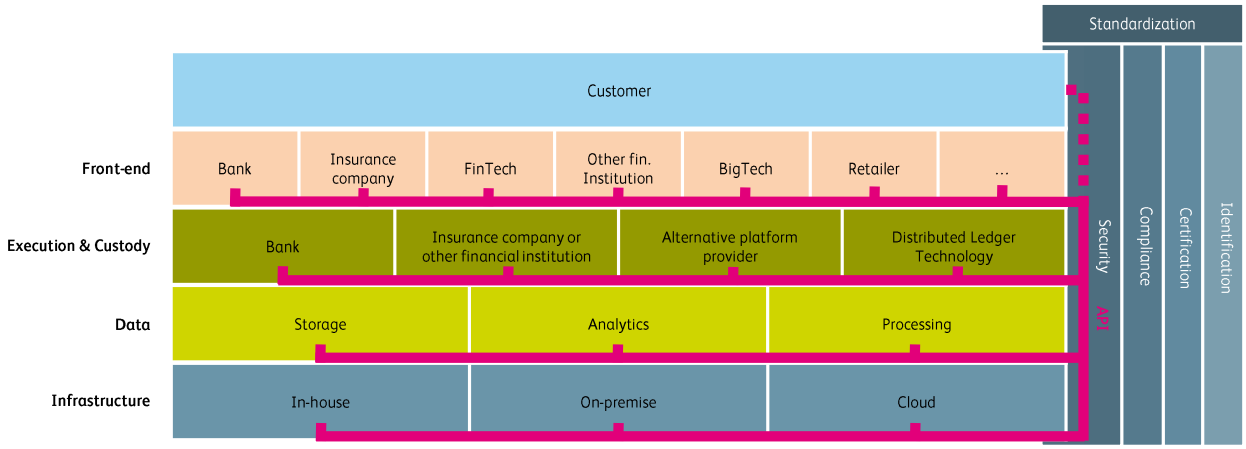

Figure 3.2: Architecture of financial ecosystems. Source: Ankenbrand et al. (2021)

Ideally, open banking results in a better experience for consumers through an improved customer journey (see Figure 3.3).

One of the first regulation-driven initiatives towards open financial ecosystems was the Open Banking initiative launched by the UK Competition and Markets Authority in January 2018 (Open Banking, online), followed by the European Union's PSD2 in September 2019 (European Commission, online), which makes the opening of certain data to TTPs mandatory for banks. While these regulations do not apply to Swiss banks directly, it still is a strong motivation to adopt similar concepts and open up to corresponding standards, as the benefits of connected or integrated banking applications outweigh the potential threats like security risk or loss of control. In order to create good conditions for a market-driven implementation of open banking in Switzerland, the Swiss Bankers Association has published a set of guidelines for implementation already in 2020 (Swiss Bankers Association, 2020c).

One development that is emerging in the context of open financial ecosystems is the trend away from individual API-based collaborations between financial institutions and third-party providers toward platform solutions for a large number of market participants. This can also be observed in Switzerland, where there are already a number of platform providers covering a range of APIs for payment initiation, account information access and wealth management services, among others (Ankenbrand et al., 2021).

As a survey of the Swiss financial industry shows, however, the local banks do not yet feel much pressure to open their interfaces to third-party providers, even though there is perceived potential for corresponding solutions, especially in the area of payments (Ankenbrand et al., 2021). In order to promote the success of open financial ecosystems without the need of issuing corresponding binding regulations, there is a particular need to incentivize the participation of banks that hold large amounts of financial data and to reduce existing barriers. In this context, banks see the greatest benefit of open financial ecosystems in the simplified collaboration with third-party providers, for example, to leverage specialized analytics capabilities from experts, and the potential for an improved customer experience, while significant effort and cost as well as a perceived lack of standards and security related to APIs are the two biggest obstacles (Ankenbrand et al., 2021). In summary, however, it can be said that Swiss banks still have a lot of untapped potential in the area of data exchange with third-party providers, although the prerequisite for its use would actually be given. Improved data

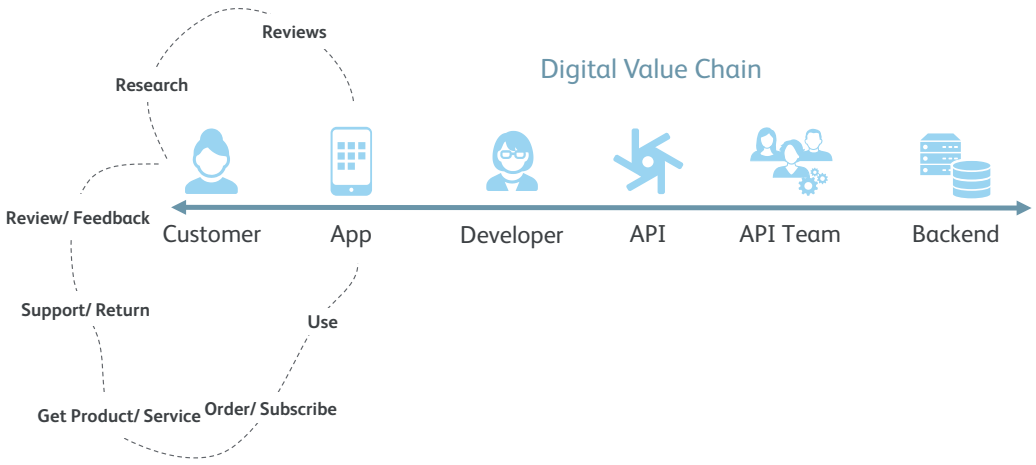

Figure 3.3: Customer journey in the digital value chain. Source: Google Cloud (2022a)

availability and volume would provide an expanded basis for harnessing the potential of data-driven analytics approaches, for example, through the use of data-intensive methods from the field of AI.

3.3. Artificial Intelligence (AI)

A further change in the technological environment in general is the adoption of artificial intelligence in almost every industry. The leap in technical possibilities driven by AI research lead to a variety of new innovations and business cases. The main factors behind this process are innovations in the field of deep learning, the growing amount of available data (e.g., by open financial ecosystems) and the accessibility of relatively cheap computing power (e.g., via cloud computing). The potential of AI in finance is estimated to add USD 1 trillion in annual value, of which USD 660 billion is accounted for by traditional AI (e.g., clustering and basic regression) and around USD 360 billion by advanced AI (e.g., neural networks) (McKinsey, 2022).

On a global level, a considerable number of banks are already applying AI, as a survey by The Economist Intelligence Unit shows. The most common use cases are listed in Figure 3.4. According to the survey, the majority of banks surveyed already heavily apply AI for fraud detection (57.6 %), optimizing IT operations (53.7 %) and digital marketing (50.2 %) (The Economist, 2022).

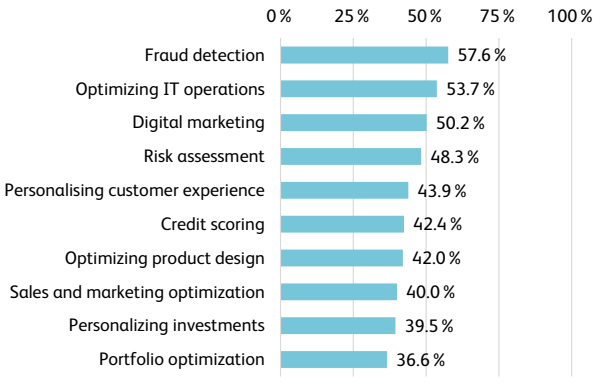

Figure 3.4: Proportion of banks making heavy use of AI per use case. Source: The Economist (2022)

Also in Switzerland, many banks already use AI in one or few business cases. This is underscored by the steadily growing number of Swiss FinTech companies, which act as suppliers to the established financial industry, that use AI (Ankenbrand et al., 2022). However, only a few of them make it a critical element of their strategic planning. Given the high pace of innovations in the field of AI and the aggregation of data through initiatives like open banking, the significance of AI for the Swiss financial industry will further increase.

What needs to be in focus is developing AI applications that solve important problems and ultimately help customers in their day-to-day financial lives. In general, there is large potential for AI and other advanced technologies to empower people, widely benefit current and future generations, and work for the common good. AI applications need to be assessed, also from a risk perspective, against the following objectives (Pichai, 2018):

1. Be socially beneficial
2. Avoid creating or reinforcing unfair bias
3. Be built and tested for safety
4. Be accountable to people
5. Incorporate privacy design principles
6. Uphold high standards of scientific excellence
7. Be made available for uses that accord with these principles

To create ethical and unbiased AI solutions, banks can adopt a number of best practices. The following considerations can serve as examples:

- Use a human-centered design approach
- Identify multiple metrics to assess training and monitoring
- When possible, directly examine your raw data
- Understand the limitations of your dataset and model
- Test AI solutions consistently and thoroughly
- Continue to monitor and update the system after deployment

If these ground rules are followed, AI can lead not only to better business performance for the banks themselves, but also to improved products and services for end customers, for example through greater personalization.

4. Regulatory Aspects

Financial services providers in Switzerland as elsewhere need to carefully consider regulatory aspects in their decision-making and continuously adapt to their changes. Switzerland's regulatory framework governing financial services activities consists of various federal laws and implementing ordinances (Ankenbrand et al., 2021). Two legal frameworks in particular are the focus of interest as of November 2022. The Swiss Financial Market Architecture consists of the Financial Services Act ("FinSA") and the Financial Institutions Act ("FinIA"). Both FinSA and FinIA entered into force on 1 January 2020 governing the provision of financial services, offering financial instruments and the respective licensing requirements in Switzerland.

FinSA primarily sets out requirements applicable to the provision of financial services and the offering of financial instruments in Switzerland. FinIA provides for a comprehensive supervisory licensing regime applicable to portfolio managers, trustees, managers of collective investment schemes, fund management companies and securities firms.

FinSA and FinIA impact both "traditional" financial services providers (FSP) and FinTech companies. FinSA covers financial services providers, client advisers and manufacturers, and providers of financial instruments. This could be relevant if a fully licensed and regulated FSP intends to collaborate with a FinTech company.

FinSA sets out rules of conduct, which namely cover A) information duties, B) suitability and appropriateness checks, C) documentation and accountability duties as well as D) duties regarding transparency and due care. The information duties aim at providing clients a comprehensive and transparent overview of the services and products offered by the Financial Services Provider (FSP). In the context of data-driven banking, a key focus for banks is data governance and compliance, both of which are discussed in more detail in the following sections.

4.1. Data Governance

There are many advantages to sharing data. However, due to the often high sensitivity of financial data, financial institutions tend to be reluctant to share them with third parties. The potential value of data sharing must be weighed against the implications for customer privacy, data security, and control over competitive data. New ways, e.g. privacy enhancing technologies, offer a possible solution to this conflict of objectives. These new approaches enable the protection of sensitive data at rest, in transit and in use, which can reduce concerns about data sharing and strengthen or, in extreme cases, even replace trust in institutions.

In Europe, the trend is towards digital self-determination and consumer sovereignty, in comparison to approaches in, for example, the United States and China (see Figure 4.1). The European Commission laid another cornerstone to this end in the year 2020 (Swiss Bankers Association, 2020b) by publishing a new data strategy (European Commission, 2020a). This strategy aims to make more data available for use in the economy and society. The focus is primarily on non-personal data. At the same time, the aim is to ensure that data producers - i.e., citizens - retain control over their data. The European Commission's strategy also includes measures on how this is to be achieved. They include the creation of transparent and fair rules for data access and usage and the equipment of users with rights, tools and competences so that they retain full control over their data. Another priority of the strategy is the expansion of the European infrastructure, especially cloud capacities, in order to be able to process and store the ever-increasing amounts of data directly in Europe. This is intended to reduce the current dependence on global, predominantly American, technology companies (Swiss Bankers Association, 2020b).

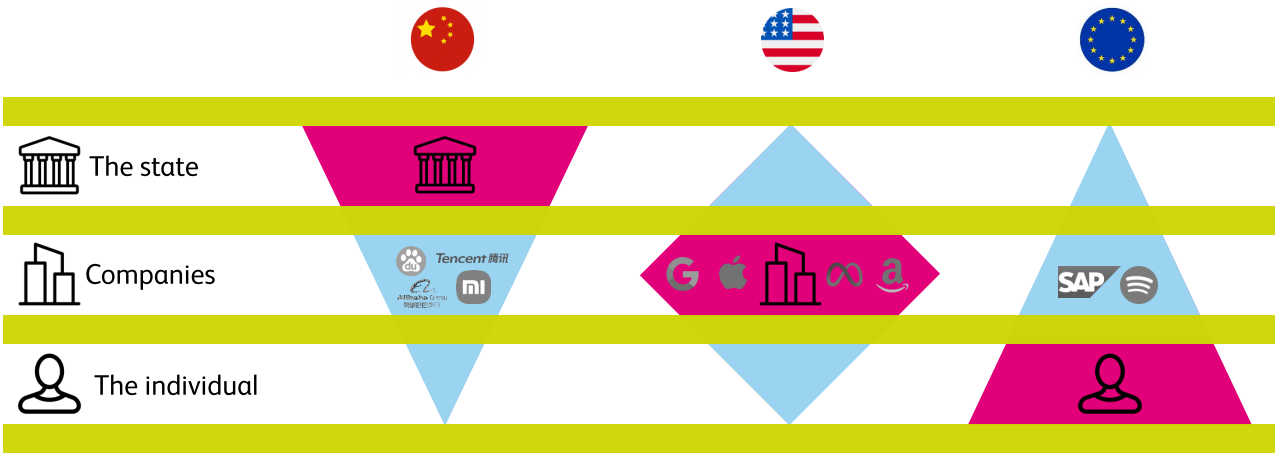

Figure 4.1: Comparison of data protection cultures. Source: Swiss Bankers Association (2020b) with information from Axon Active

In parallel with the data strategy, the Commission published a communication entitled "Shaping Europe's digital future" (European Commission, 2020c) and a white paper on artificial intelligence (European Commission, 2020b), in which the Commission sets out how it intends to support and promote the development and use of AI across the EU. With this work, the EU has laid an important cornerstone for the future design of the European data economy, underscoring the importance of data and artificial intelligence for the entire economy. The EU's ambitions are high and the timeframe it has set for itself is tight. It will therefore soon become clear whether the many words will be backed up by actions.

There are no comparable regulations in Switzerland. However, due to the high level of integration of the Swiss financial sector in international banking, it must also adapt to international requirements and, if possible, align accordingly.

4.2. Regulatory Compliance

In order to keep its capacity for innovation and competitiveness as a business location high, Switzerland must make use of its growing wealth of data. Banks and their clients' financial data in particular play a key role in this regard. It is important that Swiss banks are not at a disadvantage in the new global competitive environment of the data economy. A regulatory environment that allows the benefits of data use to be optimally exploited while at the same time taking the corresponding risks into account can help position Switzerland as a haven of security and trust.

Whether financial services providers rely on the private, public or multi cloud, the data hosting infrastructure and control framework have to satisfy regulatory requirements by the Swiss Financial Market Supervisory Authority (FINMA). FINMA defines the supervisory requirements applicable to outsourcing solutions at banks, securities dealers and insurance companies in terms of appropriate organization and risk limitation (FINMA, 2018).

FINMA does not prohibit customer data to be held abroad (Walder Wyss, 2019). The Swiss Banking Act doesn't differentiate between domestic and foreign. However, up to now banks have predominantly stored data domestically and prevented it from being accessed from abroad. In practice, there is often a misconception among banks that the moment data is pro-

cessed or accessed from abroad, banking secrecy would automatically be compromised. The Swiss Bankers Association takes a different view in its guidelines for cloud use by Swiss banks (Swiss Bankers Association, 2020a). One of the main issues is to ensure that unauthorized parties cannot access the data. There are also legal opinions that state explicitly that data can be stored and processed abroad provided appropriate safeguards are adopted (Laux Lawyers, 2019; Walder Wyss, 2019).

FINMA Circular RS 2008/21 Annex 3 regulates the regulatory requirements for handling electronic customer data from banks and securities dealers. For these, it contains requirements for an appropriate organization and aims to limit their risk. FINMA circular 2008/21 defines CID (client identifying data) as customer data that contains personal data as defined in Art. 3a of the Federal Act on Data Protection (FADP) (FADP, 2022) and makes it possible to identify the customers affected.

The existing regulations in Switzerland do not prevent the outsourcing of business processes, for example in the area of data analysis, or the storage of data in the cloud (even abroad). The prerequisites for data-driven banking would therefore also be met for Swiss banks.

5. Use Cases for Data-driven Banking

To maintain its position as a financial innovation hub of the world, Swiss banks must continuously adapt to the changing environment. With the emergence of FinTech companies and challenger banks offering low-friction services that focus on a customer's macro (savings) and micro (payments) financial journey, traditional financial institutions must also increasingly embrace data-driven banking. In general, this can create positive added value for the business success of banks via the following three levers:

1. **Cost reduction:** Technology and data can be used to digitize and automate existing business processes, for example, by reducing paper-based or human effort.

2. **Risk reduction:** While expanding access to products and services, data can be used to ensure that risk is managed correctly, so that, for example, the right products match with the right customers, and that any corporate or regulatory compliance mandates are adhered to.

3. **Revenue expansion:** Data can be used to expand access to products and services to a broader customer base and help customers achieve their personal financial goals.

In the following sections, specific use cases for these three levers are presented individually. Note that these use cases are not discussed in full depth but serve as basic ideas for data-driven banking and are based on the technological and regulatory enablers discussed.

5.1. Use Case 1 - Cost Reduction

Swiss banks have kept their total costs stable over the past few years, as has been shown in Figure 2.1. However, technology- and data-driven innovations have the potential to reduce ongoing costs in certain areas, for example by automating business processes and making them more efficient through the use of artificial intelligence. The advantage of such innovations can be demonstrated with the example of a fully autonomous onboarding process, one of the few processes every customer of a bank is confronted with. An implementation of this use case not only reduces costs and increases efficiency, but also has a strong impact on customer satisfaction. It furthermore shows a strong technology affinity of a bank in vital customer-facing processes.

For a long time, visiting the bank with official documents was the only way to verify the user's identity and his or her eligibility to open a bank account. This process is not only inconvenient for the customer, as it is time-consuming, but is also cost-intensive from the bank's point of view due to the large amount of manual work involved. As a consequence, many banks digitized the onboarding process by providing online identification via video calls, in which an employee of the bank verifies the prospect, in recent years.

With advances in AI, especially with regard to facial recognition and the passage of regulations, a new generation of fully autonomous customer onboarding solutions has recently been made possible. By completely eliminating the personal involvement of a bank employee, the potential of automation is fully exploited, and costs can be reduced accordingly. From the customer's point of view, a fully automated onboarding process can be described as follows (see Figure 5.1):

- **Step 1**: Verify identity document: With the help of modern machine learning models, the identity verification tasks are achieved without human interaction.
- **Step 2 & 3**: Liveness detection by biometric identification: Liveness detection prevents onboarding of misrepresentation through impersonation by leveraging advances in facial recognition. Without such mechanisms, a person could simply hold a victim's social media picture into the camera and the face comparison model

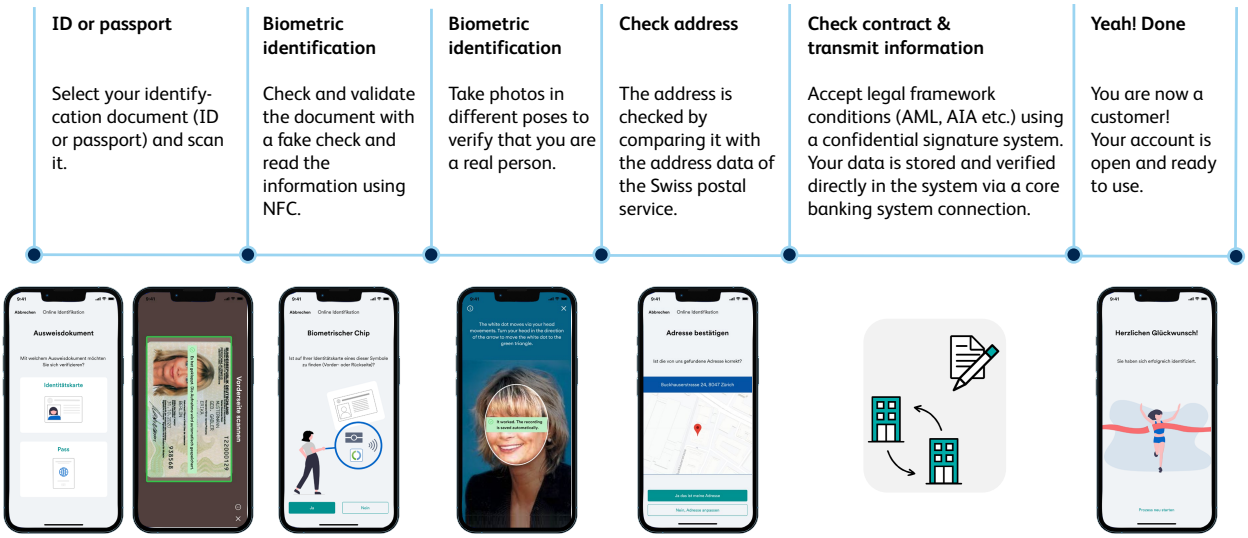

Figure 5.1: Account opening process screenflow including KYC. Source: ti&m (2022)

would recognize a match with the victim's stolen document.

- **Step 4**: Address check: The address is checked by comparing it with the address data of the Swiss postal service via a simple API call.
- **Step 5**: Sign contract digitally: Accept legal framework conditions including Know-Your-Customer (KYC) information (e.g., Anti-Money Laundering (AML) or Automatic Information Exchange (AIE)) using a confidential signature system based on a trust service provider (TSP). The data is stored and verified directly in the system via a core banking system connection. A digital signature replaces the classical signature on a contract.

In addition to customer onboarding, there are also other data- and AI-driven opportunities to reduce costs in the area of screening (potential) customers. For example, banks can install automated processes in the area of politically exposed persons (PEPs) to screen them for critical reporting in public sources, such as online newspapers. Such a process could be implemented in two steps:

- **Step 1**: Generate data using bots: Setting up a fully automated search bot that scours search engines for a specific PEP, generates a dataset of relevant public information.
- **Step 2**: Analyze data using AI: Artificial intelligence is used to check the generated data for controversial content and verify whether the search hit is actually related to the person of interest. Whether a person is tested positively or negatively can be done either fully automatically (considering the ethical aspects in Section 3.3) or in combination with a human expert.

These introductory examples show that also very customer-facing processes can be optimized using data-driven approaches. These automations are interesting from a banking perspective, particularly because of the potential efficiency gains, while customers also benefit, for example through an improved customer experience.

5.2. Use Case 2 - Risk Reduction

More recent FinTech-based banking approaches do not completely remove the human element from banking.

At some point in the client relationship, there is a time where a personal interaction is required over the phone or in a branch. Such interactions are normally around the sale of new products and services, and usually with some background checks or risk assessments involved. These essentially still manual processes can be supported by data-driven practices to optimize risk assessment on a client-specific basis.

One area where data can be used to mitigate risk is in the lending business. Banks currently use a number of techniques to mitigate the credit risks to which they are exposed. For example, exposures may be fully or partially collateralized with cash or securities through senior claims, a credit exposure may be guaranteed by a third party, or a bank may purchase a credit derivative to offset various forms of credit risk. In addition, banks may agree to offset loans owed to them with deposits from the same counterparty. Non-financial companies also continuously monitor and analyze their credit risk exposure to avoid potential counterparty defaults. Besides assessments by rating agencies, credit default swaps are commonly used financial instruments that provide information on the creditworthiness of a counterparty. However, the underlying pricing dynamics often remain unknown and demand further investigation (Roeder et al., 2022). Moreover, such risk measurement and hedging tools exist for large companies but are not available in the context of small business or personal loans.

For such kinds of loans, in particular, data-driven methods can be a key concept for identifying and quantifying potential risks and can therefore be used to support and justify credit decisions but also as an early warning system for existing loans. Although some banks already use such methods, they tend to be rule-based and therefore poorly adaptive, especially in times of uncertainty. The use of dynamic and self-learning methods from the field of artificial intelligence can further increase the forecasting accuracy of, for example, loan default probabilities and thus improve risk management at banks. If a scalable infrastructure is available, a wide range of internal and external data can potentially be used for such modelling, including consideration of different scenarios for the development of the relevant drivers. Scenario analysis is highly relevant for risk management in banks. Typically, it involves highly complex, large-scale simulations that generate billions of data points. Traditional on-premise hardware solutions have limited capacity, which is why such scenario analyses are very time-consuming. With a cloud infrastructure, such data-intensive risk management can significantly accelerate decision-making. Potentially valuable input data in this context could be, for example, the following information (Sigrist & Hirnschall, 2019):

- Financial performance indicators from balance sheets and/or income statements
- Repayment history
- Loan characteristics (e.g., amount, maturity)
- Public data (e.g., from social media platforms)
- Data from third parties such as credit bureaus, insurance companies and/or government (e.g., tax filings)

In addition to the advantages for the bank through optimized risk management and the resulting optimized allocation of available financial capital, data-driven credit risk management also offers advantages for clients, for example in the form of more accurate interest rates based on their individual financial situation.

5.3. Use Case 3 - Revenue Expansion

In addition to measures on the cost side, optimization on the revenue side can also have a positive impact on the business success of financial institutions. Recommendation systems are a well-suited tool for this purpose. In general, a recommender system uses the process of information filtering to predict which products a user might like and rates the products according to the user's preferences. While such systems are already widespread in other industries such as entertainment (e.g., "people who liked this movie also liked that movie"), there is still a lot of untapped potential in most financial institutions.

Specifically, recommendation systems can be used in banking to provide existing customers with additional

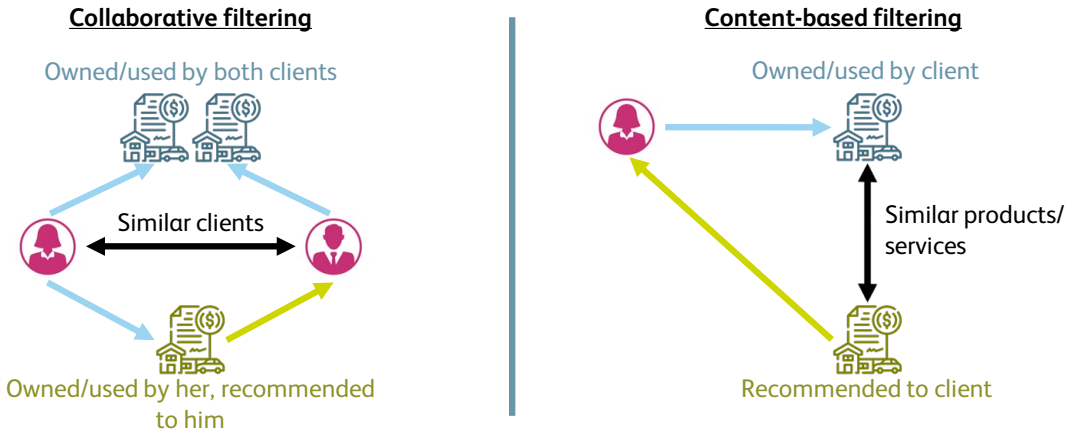

Figure 5.2: Recommender system in banking. Source: Based on Wu et al. (2018)

financial products or services based on their personal needs and circumstances. The individual preferences of clients could be determined by using existing internal and possibly external data including:

- Current product ownership
- Transactional behavior
- Credit scores
- Demographics and socioeconomic factors
- Location
- External social media profiles

In general, a distinction is made between collaborative filtering and content-based filtering to identify the most appropriate recommendations (see Figure 5.2). Both approaches are based on methods from the field of artificial intelligence, such as clustering, neural networks, or decision trees, and are situationally preferable depending on the context of use and the available data. The two approaches can be described as (Molenaar, 2022):

- **Collaborative filtering:** Method for automatically predicting a user's interests by collecting preferences from many users. The underlying assumption is that if a person A has the same opinion as a person B about a particular financial product, it is more likely that A will have B's opinion about a different financial product than that of a randomly selected person. For example, information about a customer's portfolio allocation can be used to make further investment suggestions to that customer based on the portfolio allocations of similar bank customers.
- **Content-based filtering:** Method for automatically predicting a user's interests by using similarities in the features of products and services, as well as information accumulated about the user to make recommendations. The underlying assumption is that if a person A has an opinion about a particular financial product, it is more likely that A will have the same opinion about another financial product with similar features than about a randomly chosen product. For example, information about a bank customer's sustainability preferences, as measured by the ESG rating of the investments in his/her current portfolio, can be used to recommend only products with a corresponding ESG rating.

A high-performance recommender system offers considerable advantages for a bank. These include higher revenues through up- and cross-selling, higher conversion rates and reduced customer churn. But customers also benefit directly, for example through increased personalization and customer experience, resulting in increased customer satisfaction.

6. Pathway to Becoming a Data-driven Bank

The pathway to becoming a data-driven bank can seem daunting in its complexity and time to value. However, both can be broken down via a sound approach. One of the most important points is that a bank has a vision of a data-driven business model that can be built as a series of modules or Minimal Viable Products (MVPs) to reduce complexity as well as incrementally realize time to value. Such a gradual approach can also be used to continuously gain experience and sharpen the understanding of the possibilities of data-driven banking. The creation of a specific MVP, for example for one of the use cases described earlier, is often done in collaboration with a third party provider (TPP) like a specialized technology company and can generally be divided into three main phases, which are shown in Figure 6.1.

An MVP typically runs over a period up to 12 weeks, starting with the definition of success criteria and a clear agreement on the collaboration model during this period. It is critical to identify a business use case that can show meaningful results over the agreed number of weeks. The first phase is about the creative process of generating, developing and communicating new ideas. For many use cases, it can be beneficial to include, for example, experts with regard to user experience in the MVP team to create a positive customer experience. In the second phase, the joint MVP team iterates on the solution in line with the Agile principle of "fail fast". Failing fast means to have a process of starting work on a project, immediately gathering feedback, and then determining whether to continue working on that task or take a different approach. The MVP is thus continuously adapted in short steps to the generated feedback. Finally, the MVP team implements the solution identified and provides the information required for internal stakeholder management and decision-making.

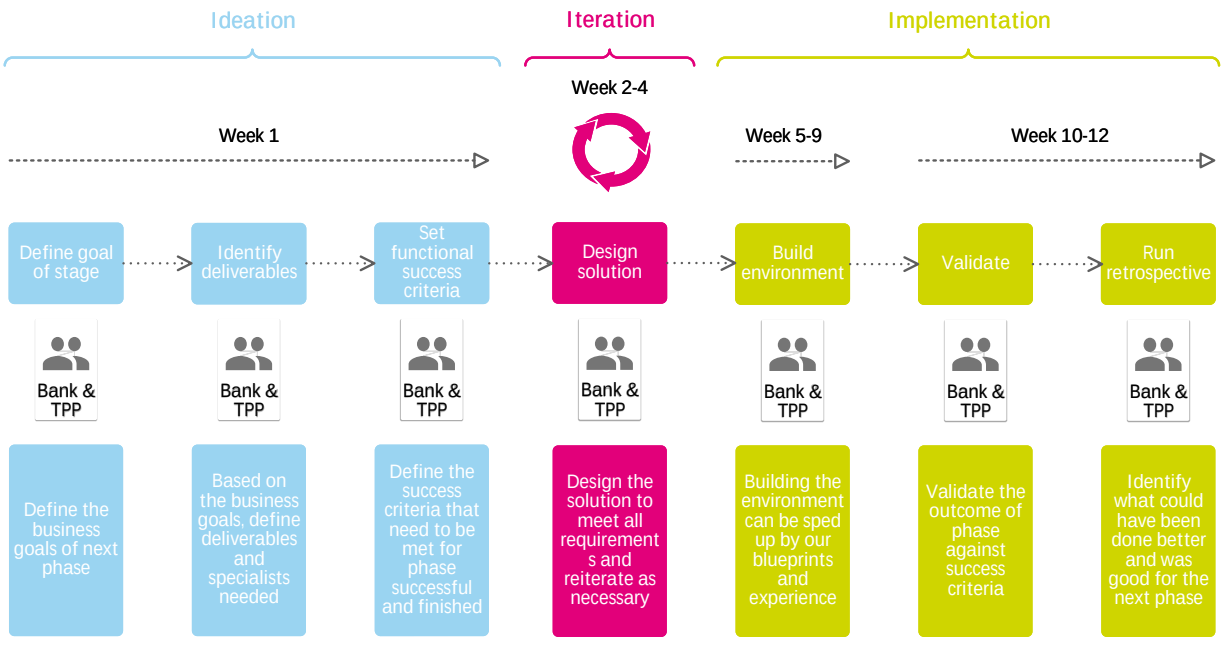

Figure 6.1: MVP approach. Source: Based on Google Cloud (2022b)

The incremental creation of such MVPs and their scaling and linking ultimately leads to the realization of the vision of a data-driven bank.

One obstacle for many Swiss banks to develop such MVPs and thus to move towards data-driven banking is their limited innovation capacity in the IT area (Ankenbrand et al., 2022). This can be countered by working with external partners. Such a service is offered by various providers in Switzerland, typically with strong IT competences, and usually includes the entire process chain for creating specific MVPs in a short time using specialized teams. Banks can therefore not only achieve quick successes in data-driven banking through such cooperation, but also gain relevant experience, build up internal competences and get used to a new culture of innovation.

In general, the technological and regulatory conditions for a transformation to a data-driven bank would be in place in Switzerland. However, in order to practice data-driven banking successfully, Swiss banks need a fundamental change in mindset. The often prevailing compliance mindset, which in many cases prevents or at least slows down innovation, must give way to a technology- and data-friendly culture in order to be able to exploit the full potential of data-driven banking within the given legal framework.

7. Conclusion

The present white paper aimed to analyze and discuss the drivers and potential of data and corresponding analytics for the Swiss financial sector in a structured way. The core findings are summarized in the following four statements and theses:

Comparatively low penetration of data-driven banking in the Swiss financial industry. Most Swiss banks have not yet explored deeply into data-driven banking. This is despite the fact that the potential of data analytics and artificial intelligence for their business model has been generally recognized by bank representatives in Switzerland, as existing surveys on this topic show. In order for Switzerland to remain one of the world's leading financial centers in the future, the industry must, however, continuously and dynamically adapt its business models to the changing environment so that it remains competitive in the long term. This increasingly requires the broad and consistent use of data and data analytics, as is already common in other industries and is also more and more practiced by the Swiss FinTech sector.

Technological and regulatory developments are pushing banks. Important enablers or drivers for data-driven banking can be found in current technological and regulatory developments. The former relate in particular to the slowly emerging transition towards cloud-based IT infrastructures for Swiss banks, their opening to third-party providers via open financial ecosystems (e.g., open banking), as well as the continuous advancements in the field of artificial intelligence to generate new insights for banking based on internal and external data. Relevant regulatory aspects in connection with data-driven banking relate in particular to data management and compliance, which, like the technological requirements, cannot in principle be seen as an obstacle to the use of corresponding approaches by Swiss banks.

Great potential in many areas of the banking business model. The application of data-driven banking can have a positive impact on the business success of banks through three main levers. First, concrete use cases, such as fully automated customer onboarding or checks of potentially politically exposed persons, can reduce costs for financial institutions. Secondly, business risks in banking can also be reduced through the use of data-driven insights, e.g., in the area of lending through more accurate default predictions. Thirdly, in addition to potential improvements on the cost and risk side, the revenue side can also benefit from data-driven banking. Concrete applications such as recommendation systems can help financial institutions to increase their revenues through up- and cross-selling, higher conversion rates and lower customer churn. But customers also benefit directly, for example through better personalization and customer experience, leading to higher customer satisfaction.

Just do it. Due to the perceived high complexity and long implementation times for data-driven banking, smaller banks in particular are discouraged from benefiting from its great potential. However, the transformation to a data-driven bank can be done step by step with an organized approach, also in order to continuously gain experience. An approach via the development of minimal viable products (MVPs) in cooperation with specialized technology providers is particularly suitable if the required competencies are not available in-house. In a short period of a few weeks, this can already produce initial results in certain use cases that the bank considers to be particularly value-adding, which in turn can serve as the basis for further development in the direction of a data-driven bank. The banks should simply dare to take the first step, because the necessary conditions are in place in Switzerland, be they technological or regulatory.

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