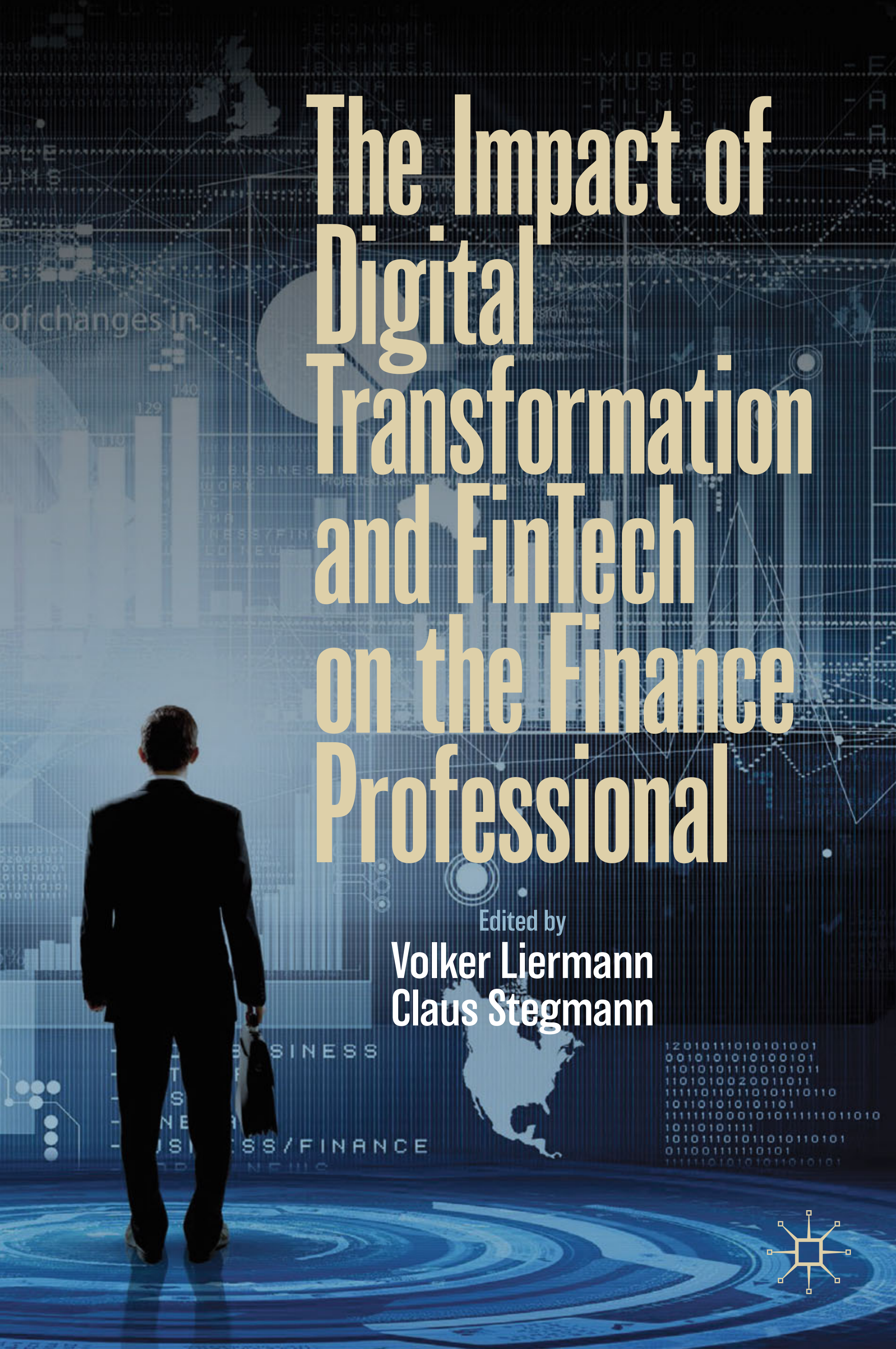

The Impact of Digital Transformation and FinTech on the Finance Professional

Edited by

Volker Liermann

Claus Stegmann

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Volker Liermann · Claus Stegmann
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Editors
Volker Liermann
ifb AG
Grünwald, Germany

Claus Stegmann
ifb Americas, Inc.
Charlotte, NC, USA

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Preface

Digitalization has gained substantial recognition in a broad range of very different areas. Drastically reduced prices for both on-premise and cloud storage combined with an extreme increase in IT performance have served to make artificial intelligence (AI) including machine learning and deep learning more and more part of our daily lives. Younger kids will not remember a time without personal assistants like Alexa and Siri, or commands like “Hey Google” or “Hey Mercedes”. The technology sector led by Google, Apple, Facebook, Amazon (GAFA) is investing heavily in these technologies as well as blockchain for their software, services, analytics and devices. The automotive, logistics and health-care sectors as well as many others are currently undergoing massive change processes and will be entirely different 10 years from now.

This book takes an in-depth look at how digitalization is affecting players in the financial sector including banks and insurance companies. Moreover, within the finance sector, this work is explicitly focused on analytical topics including finance, accounting, regulatory reporting and client-related aspects. In the wake of the financial crisis, the finance industry had to invest heavily in data integration, processing and data lineage to comply with a long list of new regulatory requirements. Basel III was internationally agreed in 2017 and new regulations are on the way. The coming regulations will likely be less extensive and less costly than what banks have had to deal with in the past few years. On the other hand, banks and insurance companies must use the data generated for regulatory purposes to optimize analytical processes, accelerate reporting for decision-making and, most importantly, improve prediction of client behavior. The demand for the abovementioned advanced analytical methods will increase sharply in the risk and finance departments of financial institutions.

This will change the financial professionals' perspectives and require their ability to understand AI, deep learning, machine learning or blockchain technology. In addition to this, the architectures and infrastructures will have to mirror these method-driven improvements. Of course, the financial professionals will not be required to invent these methods themselves. They already exist and, combined with cloud services, are being offered by the big technology players or flexible fintech companies on the market. Financial professionals will be required to evaluate, tailor and implement these methods whenever they can leverage the available processes. They can even present entirely new opportunities in holistic financial planning or simulation.

Regulators also have to take these technologies into account. On the one hand, they have to evaluate whether neuronal networks, for example, can amend common risk methods. Another example described in this book consists of using blockchain technology for syndicated loans. Regulators will have to approve applications and processes like this in the future.

This book is intended to provide a full spectrum of information, from the fundamental principles of digitalization to concrete examples of how new methods and infrastructures can be applied and implemented in the existing bank and insurance IT architectures. A central focus here is on the area of bank management, in which risk management, planning, data integration and data lineage will be improved dramatically in coming years.

The authors have created a comprehensive work of broad yet in-depth content, which will benefit risk managers, finance managers, managers for regulatory and internal reporting and IT managers alike.

I hope this book helps and encourages all readers to embark on a successful, albeit demanding, digital journey.

Frankfurt, Germany

Dr. Andreas Dombret
Former Board Member of Deutsche
Bundesbank (2010–2018)

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Introduction

Volker Liermann and Claus Stegmann

1 Introduction

1.1 Why This Book?

The financial sector and in particular the banks are in a state of upheaval. Haven't they been continuously for the past twenty or thirty years? Digitalization as a megatrend with all its sub-aspects is hitting all industries and many of the templates for better business generation[1] and cost optimization look quite similar across these industries.

What are the fundamental differences between the financial services sector and other industries? The business environment surrounding banks has the additional load of excessive regulation requirements and technology-driven competitors (fintech companies or GAFA[2]). Depending on the region,

[1]Generating better business based on better contact with clients and a better understanding of clients' needs.

[2]GAFA—technology companies—Google Amazon Facebook Apple.

V. Liermann (✉)
ifb AG, Grünwald, Germany
e-mail: volker.liermann@ifb-group.com

C. Stegmann
ifb Americas, Inc., Charlotte, NC, USA
e-mail: claus.stegmann@ifb-group.com

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other challenges like geopolitical uncertainties, increasing credit risk driven by the end of a long economic cycle or a low-interest rate phase must be added to the business environment.

Before delving further into the details of the banking business environment, we would like to introduce you to the focus of this book, namely the impact on financial professionals. Does the storm taking place in the financial industry effect the financial or risk management department? Will the cacophony of "blockchain, fintech, AI, Zettabyte Era, RPA, …" spouted out by consultants, tech evangelists and other prophets affect the accountant and risk manager? The answer is yes, but to a different extent than other parts of a financial institution are affected.

In this introduction and the first part, we will be looking at aspects of digitalization and fintech companies in more detail to explain the impact on the financial industry. The second and main part of the book will illuminate those aspects from the perspective of a financial department and cover the bank management matters involved. Given the importance of regulation to the industry, we address the regtech dimension in part three. The final part summarizes new and different methods being applied within the environment of financial professionals as well as the technology and architecture considerations. The book ends with summary and outlook in the final chapter.

1.2 Setting the Scene

So again, why is digitalization affecting and frightening stakeholders in the financial industry differently than those in other industries? First of all, the competitors (fintech or technology companies) are by nature better in leveraging technology to decrease costs and satisfy customers. Secondly, most competitors focus only on parts of the value chain. Thirdly, the outdated IT landscapes and encrusted organizational structures in traditional banks prevent quick changes. And lastly, the scaling effect of digital business models poses an overwhelming threat.

When it comes to digitalizing business models, there is no guaranteed success if gone alone. Application programming interfaces (APIs) enable traditional banks to compete with new competitors along the entire value chain. The idea behind this consists of establishing a digital financial platform/ecosystem. This is referred to as platform banking, API-based banking or open banking. Platform banking is to some extent driven by the European Payment Services (PSD 2) Directive (EU) 2015/2366

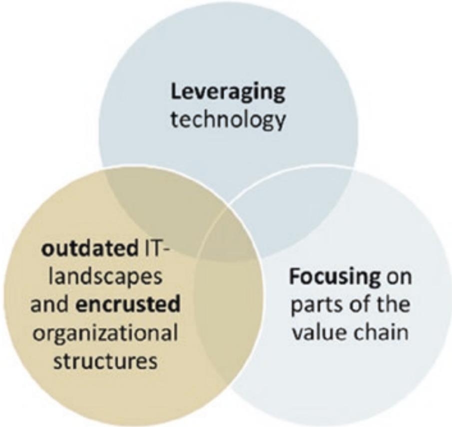

Fig. 1 What can competitors do better?

(see The European Parliament and the Council of Union, 2015), which forces European banks to provide access to client's payment data (naturally only with the client's consent). Figo is a well-known example of such an API provider (see Figo GmbH, 2019). PSD 2 opens up business opportunities for new market participants, as it makes it much easier to switch banking service providers (Fig. 1).

Many of the traditional banks, however, have accepted this challenge and are doing well in adopting the strengths of their competitors. The gap in organizational flexibility is being closed using agile methods, albeit only to a minor extent. Technological advance is being absorbed to some extent by way of co-innovation, investment or copying the best parts. The competition is driving banks to rethink their core bands and competencies to focus and reshape their business model. However, outdated IT landscapes and legacy systems are slowing innovation and transformation.

Talk of leveraging technology leads to the question: What will drive the business models of banks in the future? In 2015, Lloyd C. Blankfein, CEO Goldman Sachs, called the company a "technology company" based on the fact that Goldman Sachs has 9000 programmers. David McKay CEO Royal Bank of Canada responded by saying, "If a bank thinks it is a tech company, then it is wrong. We are still business-to-consumer and business-to-business companies, trying to meet customer needs. Banks are using technology to anticipate those needs and meet them in a creative way, but we don't derive our income from technology" (RBC CEO Dave McKay looks to stay ahead of technology, 2017) (Fig. 2).

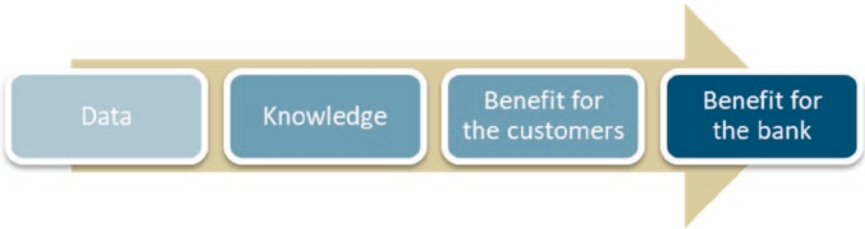

Fig. 2 The path of benefit

With regard to technology, the cloud and various cloud strategies[3] require mention. The primary benefits of the cloud include scaling based on changing requirements (timing and changing resources) as well as the associated cost advantage and efficiency. The financial sector still has certain reservations regarding the cloud due to the sensitive data involved and the reputational impact a data leak would cause. Cloudera has an interesting approach to accompany clients from an on-premise environment to a private or public cloud in development over time.

Robert Solow stated in 1987, "You can see the computer age everywhere but in the productivity statistics" (Solow, 1987, July 12). A deeper look at digitalization's impact on financial institutions could lead to a similar assessment today. The main question is: Do we serve the customer better by using this technology?

To a certain extent, Dan Ariely already summed up big data in 2013 in a way that could now be applied to AI, machine learning, deep learning and blockchain: "Big data is like teenage sex: everyone talks about it, nobody really knows how to do it, everyone thinks everyone else is doing it, so everyone claims they are doing it" (Ariely, 2013, January 6). Banks have to decide if their business model is technology or customer-centric. The latter will be the future!

Design thinking (Brown, 2008, June) puts the client first from the initial stages of the product development process. Concepts like Customer Journey (CJ) and Context Driven Banking (CDB) focus on being there for the customer at the right time.

Fintech companies and technology companies (GAFA) are by far more dynamic (in terms of organizational structure and innovation speed) than traditional financial institutions. Fintech companies are most successful in picking well-chosen parts of the value chain and providing better

[3]Private cloud, public cloud, … .

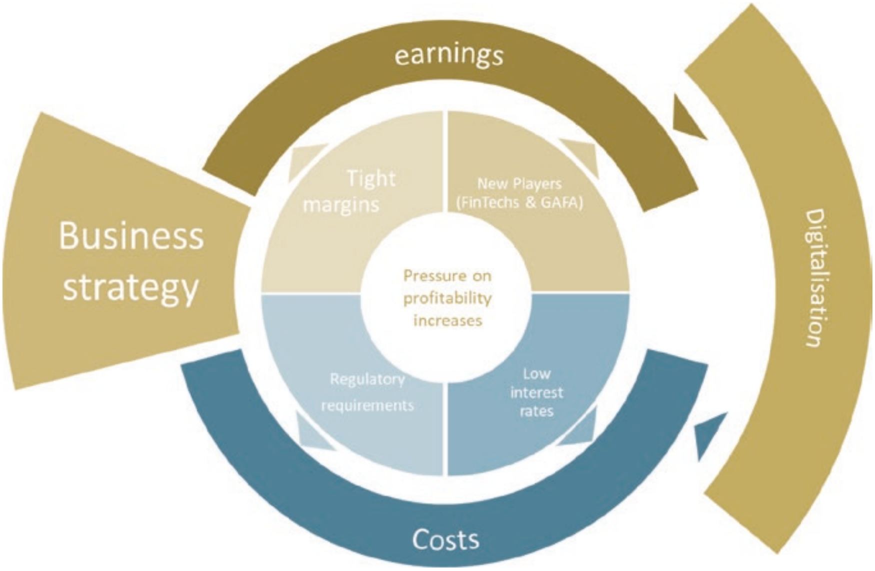

Fig. 3 Impact of digitalization on earnings and costs

(i.e., cheaper or more convenient) services. However, these companies are restricted due to their limited capital. A bigger threat is posed by the GAFA companies due to their deep pockets and the ability to change the playing field of a whole industry, like Apple did with the music industry or Google with maps. The impact is already being felt in the payment context in the form of Apple Pay, Google Pay and Alipay.

1.3 Impact on Financial Professionals

Financial and risk management professionals can only contribute to the client-centric business models on a small scale. But they could be less restrictive on business than is currently the case. Financial and risk management have to become more dynamic, adoptable or, to use the digitalization buzzword, "agile."

The cost saving aspect driven by optimization and automation up to automated decision-making, can significantly improve banks' stability and agility. The templates for this do not differ much from those applicable to other industries.

The twofold impact of digitalization is illustrated in Fig. 3. Banks in Europe are suffering from an enormous pressure to increase profitability.

Digitalization can impact the business strategy on both ends of the spectrum (earnings and costs).

The model's and architectures developed for understanding the customer better, can be applied to risk management and, to a lesser extent, financial management. Model improvements offer significant enhancements in predicting the future and providing a foundation for better management decisions. All of this requires data, which has to be transformed into information and then knowledge.

New technological foundations are adopted by the technology companies (GAFA). Examples of this include Hadoop and Hana. While Hadoop allows for scaling, SAP Hana can accelerate aggregation at the database level to drive data analysis on another level. Hadoop incurs reasonable implementation cost even at scale. SAP Hana offers new business applications resulting from the speed improvements provided by new technology.

The predominate business model in the financial sector centers around risk, which implies an excellent knowledge of the risks taken and an outstanding ability to manage these risks. Data ["Data is the fuel of the digital economy" (HM Treasury, 2018)] turned into information has always been the main ingredient for the financial sector's risk-based business models. Incorporating new previously unavailable data or more detailed (i.e., more granular and interconnected) data provides the potential to improve risk analysis.

The distributed ledger technology opens up a wide space for optimizing internal processes as well as improving customer satisfaction by speeding up communication and by increasing commitment. The syndicated loan use case is a good example for both (internal and client-oriented) potential improvements.

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Part I

Automation, Distributed Ledgers and Client Related Aspects

The world is changing and so is the financial services industry. Bill Gates said, "banking is necessary, banks are not"—a disruptive statement to say the least. That was all the way back in 1994. But will it become true in our age? Although most American banks are quite profitable,[1] fear of disruptive change has been significant in recent years. In 2014 banks started fearing the fintech companies and their ability to disrupt the banks' business models. In 2015 and 2016, it became clear that they are "only" ripping out certain parts of the bank's value chains. Due to their focused approach, many fintech companies were quite successful in doing so to a certain extent. Robo-advisors are a good example of this.

Other fintech companies have proven that they understand the customer needs better than the traditional financial institutions. N26[2] is an example of a start-up that at first simply sought to provide a digital wallet for young people. The company then realized that parents showed interest in a more digitalized bank. Based on this, they developed a purely smartphone-based bank by decomposing the classical services in a user-friendly way. The higher grade of digitalization produces a significant amount of data, which can be used to understand what customers need in new depth. Examples of this approach are NBO,[3]CJ[4] and context driven banking.

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[1]Especially in contrast to the German banks.

[2]N26 (formerly known as Number 26 until July 2016) is a German direct bank, headquartered in Berlin, Germany [see (N26 Inc., 2019)].

[3]NBO—Next Best Offer

[4]CJ—Customer Journey.

Bitcoin is a well-known application of the distributed ledger technology. While it first targeted sanctions-free transfer of value, bitcoin has now developed into a currency-like payment alternative [see (Nakamoto, 2008)]. Driven by the architecture, the intermediators (normally financial institutions) are cut out of the process, thus restricting traditional financial institutions' customer contact to a minimum.

Even some central banks like the Monetary Authority of Singapore (MAS) [Project "Ubin" see (Singapore Exchange, 2018)], the Bank of Canada [Project "Jasper" see (Chapman, Garratt, Hendry, McCormack, & McMahon, 2017)] and the German Bundesbank ["Forschungsprojekt Blockchain" in (Bundesbank, 2017)] are experimenting with distributed ledger technology. In a research project conducted by the German Bundesbank in 2017, they mirrored bonds into a distributed ledger using Hyperledger. This same pattern can be found with regard to so-called security tokens. In addition to the distributed ledger implementation, security tokens promise to exchange the token with things in the real world (goods or money). This type of asset-backed or Bretton-Woods-style[5] cyber-currency could push this kind of distributed ledger to a new level.

While the world of tokens and public blockchain is continuously transforming, the distributed ledger technology with private blockchains is opening up interesting new applications. This includes we.trade in the area of trade finance and digital replicated bonds using blockchain technology (LBBW and Daimler Benz) as well as Everledger in the diamond certification domain.

A core aspect of digitalization that covers almost all areas is robotic process automation (RPA)[6] and workforce automation. Over the long term, RPA aims to replace manual decisions using robots that can identify decision patterns. This transformation is rarely done with a big bang, especially in traditional financial institutions, but rather performed incrementally. The different levels of process automation are shown in Fig. 1. The six levels indicated here span from manual decisions to autonomous decision-making.[7]

Robotic Process Automation (RPA) is intended to relieve people of performing dull repetitive tasks in front of their computer screens all day long. RPA replaces human labor but also minimizes the risk of human error. RPA

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[5]The Bretton Woods system of monetary management established among the United States, Canada, Western Europe countries, Australia and Japan in 1944. One key element was that the exchange rate between the dollar and an ounce of gold was fixed.

[6]RPA—Robotic Process Automation.

[7]The 5-step decision automation model is dealt with in detail in (Bitcom, 2017).

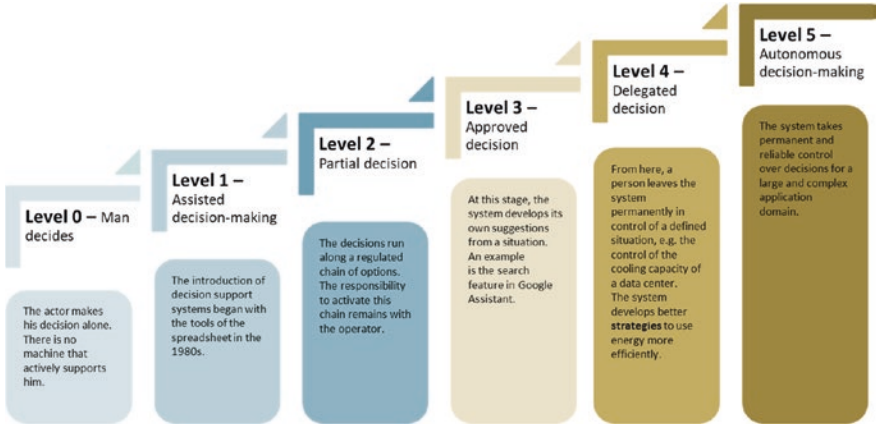

Fig. 1 5-step decision automation model

helps rethink and redefine financial services processes. A decision has to be made, as to which parts of the process can be fully or partially automated and when. Simply put, RPA is software that uses artificial intelligence (AI) and has machine learning capabilities to handle repetitive high-volume tasks.

Workforce virtualization using robotics has the potential to fundamentally change the way financial institutions tackle multiple areas of process execution while providing significant business benefits. While its rapid introduction is almost inevitable, leading companies will use it as a way to not only reduce costs, but also to improve controls and improve employee effectiveness, make them more productive and evaluate them within the organization. The coverage of digitalizing processes differs significantly between traditional non-digital banks and challenger banks.

While Fig. 2 shows the primary steps of process automation (on the left), it is important to understand that the early steps only contribute minor growth in efficiency. The real boost happens when decision-making is automated.

Aspects like standardized processes and process industrialization are necessary milestones on the road to full digital transformation. In recent years, companies in the US and Europe have sought to reduce their operating costs and increase their overall efficiency by standardizing, centralizing and sometimes outsourcing a wide range of processes. These processes were initially of high volume but with little added value, e.g., Accounts Payable, Accounts Receivable, General and Subledger bookings, expense reports and other activities once performed at the company's headquarters. Over time,

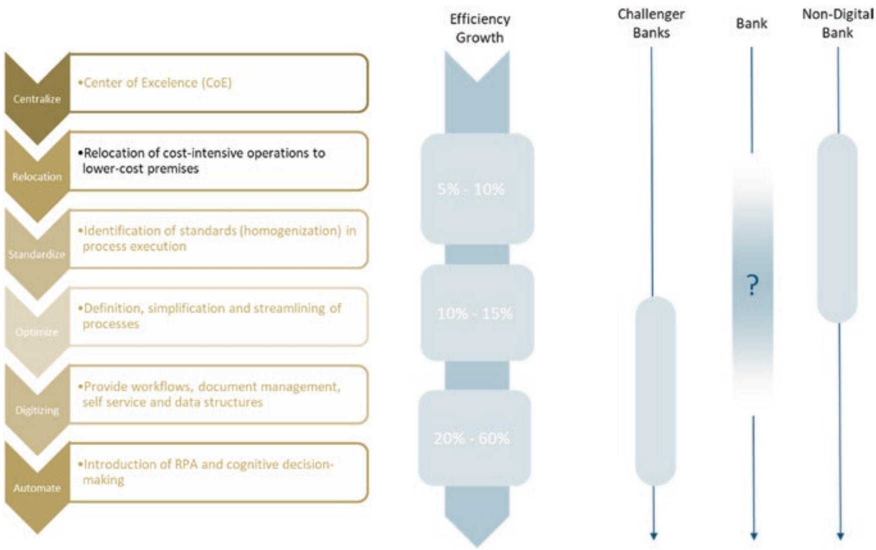

Fig. 2 Automation of Location Determination

more complex and sensitive "industrialization" processes have been introduced through standardization and the use of third-party platforms. These include compliance, compensation reviews and policies, contract management, and a variety of other corporate functions, many of which relate to risk management.

Examples of this transformation include risk reports and batch processes. Extensive, time-consuming risk reports are perfect candidates for automation that allows for timely, accurate and comprehensive data quali<ty reviews and remedial actions as indicated. Batch processes can be separated into two tasks: (A) monitoring and validation of already automated processes (e.g., data transfer) and (B) automated decisions on whether processes should be restarted or whether manual steps are necessary.

Chapter 2 "Batch Processing—Pattern Recognition" (Liermann, Li, & Schaudinnus, 2019) describes a practical application of monitoring and data-pattern recognition. The chapter introduces the necessary framework for such tasks, including data lakes and methods like Bayesian networks, random forest and autoencoders.

The next subsection focuses on private blockchains and introduces the Hyperledger framework that is part of the Linux project. The two chapters focus on different aspects of the Hyperledger framework. As stated earlier, the blockchain applications can generally be split into two kinds of domains: the public blockchains (e.g., bitcoinand Ethereum) and the private blockchains (e.g., Hyperledgerand Corda). This book focuses on private blockchains, because we see more potential and applications here for financial services companies.

Chapter 3 "Hyperledger Fabric as a Blockchain Framework in the Financial Industry" (Bettio, Bruse, Franke, Jakoby, & Schärf, 2019) introduces the main components and concepts of Hyperledger Fabric. The chapter provides an in-depth description and can be seen as a summary of the documentation for the Hyperledger project. Concepts like nodes of a blockchain, permissions and blockchain channels are explained as well as the consensus mechanism and design possibilities Hyperledger Fabric offers on this side. Chapter 4 "Hyperledger Composer—Syndicated Loans" (Dahmen & Liermann, 2019) describes the Hyperledger Composer tool and a practical application for syndicated loans. Hyperledger Composer is a tool used to develop rapid prototypes based on the Composer modeling language.

The last two chapters of this part address client-related aspects like NBO, context-driven banking [see "The concept of the next best action/offer in the age of customer experience" (May, 2019)] and prospect theory within the context of wealth management documenting the client-oriented approach of a Robo advisor [see "Using prospect theory to determine investor risk aversion in digital wealth management" (Lisson, 2019)].

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