

Roland Frank · Gregor Schumacher ·
Andreas Tamm

Cloud Transformation

How the Public Cloud is changing
businesses

 Springer



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Foreword

Anyone who thinks that *Cloud Transformation: How the Public Cloud is Changing Business* (*Cloud-Transformation: Wie die Public Cloud Unternehmen verändert*) is just another attempt to get CIOs to use cloud infrastructure services instead of their own data centers is completely wrong. The three authors combine a rare blend of economics, corporate strategy experience, and modern IT architecture in one book. It is therefore particularly aimed at interdisciplinary readers, both in established companies and in start-ups.

At the beginning of the cloud computing era, many IT leaders in Europe particularly thought of public clouds as a continuous evolution of traditional IT operations and outsourcing offerings. However, the “Infrastructure as Code” approach, which offers fully automated procurement of infrastructure via an API in a matter of minutes or even seconds, showed how radical and innovative public clouds were. Although their IT infrastructure was comparable to traditional IT services at the beginning, the business model is the real disruptive innovation. Thus, “cloud transformation” has become the key enabler of innovative digital business models in most industries.

The current work by Frank, Schumacher, and Tamm helps corporate strategists to navigate the standard American literature of the tech industry and to find the sensible direction of their digital strategy in the context of their industry. This is not just about new digital products, with which – detached from the core business – hardly any conservative investor or owner in Europe can be convinced. In established companies, the digitization of existing products or services is the key to success. In the process, existing products can take on a different “digital intensity.” Especially when an industry is seriously transformed by offerings of a very high digital intensity, as online retailers have experienced in retail, companies need to radically question their value creation. If necessary, an established company must cannibalize itself to avoid disruption by a newcomer. That’s why, for example, competing automotive giants like Daimler and BMW are jointly driving forward digital mobility solutions. Even if fewer cars are sold as a result, a new user group is addressed that prefers to rent vehicles on a short-term basis rather than buy them.

Books like *Cloud Transformation*, which master the bridge between technology and business, are so important for realigning any industry. The fundamentals of digital business models are the same everywhere, whether they’ve been selling computer

infrastructure or cars. The general availability of cloud-native technologies, with machine learning and IoT backends, is accelerating market transformation. This makes their digital strategy not just a corporate strategy but a survival strategy – even as a current market leader!

Dr. Ried

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Images: <https://www.stefan-ried.de/#publicimages>.

Preface

In 2010, the animated film *Cloudy with a Chance of Meatballs* was released in the German version: *Wolkig mit Aussicht auf Fleischbällchen*. This film is about an ingenious inventor whose ideas have not been appreciated until now, be it spray-on shoes or devices that can read the minds of monkeys. It is only when he invents a machine that can turn water into food, which suddenly takes on a life of its own and eventually disappears into the clouds (“Cloud”), that he gains the public’s attention. Because everyone can now reap the benefits of the “Cloud,” every resident of the city gets an account with which they can trigger food orders. Pizzas, hamburgers, spaghetti with tomato sauce, and meatballs are now available to everyone and at any time.

It’s a similar story with the public cloud: Software and IT infrastructure from the public cloud mean an incredible gain because they are available to everyone at all times – and that applies to both the private users of these services and companies. Dropbox, Lieferheld, Spotify, and Co. have become an indispensable part of our everyday lives. All of these cloud applications have integrated themselves inconspicuously but firmly into people’s lives.

The same applies to numerous enterprise applications that are available via the public cloud: The increase in efficiency and convenience are so great that companies that have already dared to move to the public cloud can no longer imagine returning in many cases.

Surprisingly, however, these advantages have not yet led to companies making intensive use of the cloud. According to a survey by Bitkom, 73% of companies in Germany already use cloud computing, but so far the use is generally limited to the areas of data storage (61%), e-mail applications (48%), or office applications (34%). The real benefits that can be realized by using the cloud play only a minor role: for example, agile software development, digital business models, new work processes, and flexible cost structures.

So, it’s no wonder that for many managers the topic of the public cloud is still more of a duty than a freestyle part of their daily work. In many cases, individual technology-savvy employees have to drive the majority of the company ahead of them. *Cloud Transformation: How the Public Cloud is Changing Businesses* aims to help cloud experts better communicate the benefits of the new technology – and help managers get to grips with the new issues.

Expecting a sales employee to understand and judge all legal contract details would be asking too much. Similarly, it doesn't make sense to have the accountant create the UX design of their new analytics software themselves. The specialization benefits in these sub-areas are so great that it is a full-time job to professionally implement the activities behind them. The starting position for managers, however, is different: While even they cannot be expected to develop software themselves or to be able to evaluate the code of their developers – they should know and be able to correctly classify the major economic and business contexts of the IT architectures used. Because this results in decisions that strongly influence the competitiveness of their digital business models – and ultimately the continuity of all the other tasks and activities in a company depends on this.

To be able to take on a responsibility of this scope, fundamental knowledge in the areas of digitalization of business models, cloud computing, and software and organizational development will be increasingly expected in the future. If managers succeed in gaining this overview, they will be able to mediate between the different departments as contact persons – and last but not least: make the right decisions.

This book is dedicated to these four areas – digital business models, cloud computing, software, and organizational development. It provides managers with a tool that enables them to (re)start the dialog with the business departments and drive the cloud transformation within the company. The book is written in such a way that IT laymen can follow the explanations – but at the same time, IT advanced users can also take away new ideas and concepts for the management and realignment of companies for their daily work.

Several people were involved in the creation of this book, and we would like to take this opportunity to express our sincere thanks to them:

- Many thanks to Ms. Wiegmann, our editor at Springer, who intensively accompanied the creation of this book from the first idea to publication.
- In addition, a big thank you to the employees and managers of Arvato Systems, who provided the template for this book with the cloud transformation in their company.
- We would like to thank our editor and proofreader: Dolores Omann and Jan-Erik Strasser, on whom we put a lot of pressure due to our tight deadlines.

Finally, we express our heartfelt gratitude to the people in our immediate circle who have supported us in the last few months, and the book would not have been possible without their cooperation and encouragement.

Fabiola, Valentin, Daniela, Tina, and Jutta: Thank you very much. This book is dedicated to you.

Munich, Germany
Berlin, Germany
July 2019

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Contents

1	Do You Remember Daimler, RTL and Siemens?	1
1.1	Introduction	1
1.2	The Innovator’s Dilemma Can Affect Any Company.....	2
1.3	Disruptive Technology – Public Cloud.....	5
1.4	The Aim of This Book: Surfboard Instead of a Lifebelt.....	7
	References.....	12
2	Everything Becomes Digital	15
2.1	Technical Digitization.....	15
2.2	The Consequences of Digitisation: Decentralisation, Communication, Convergence	17
2.3	The Complete Digitalisation of Value Creation.....	21
2.4	The Platform Economy – Data Is the New Oil.....	22
2.5	Conditions for the Successful Operation of Digital Platforms.....	26
2.6	Success Factors for the Use of Digital Platforms	32
2.7	Conclusion.....	40
	References.....	41
3	The Road to a Zero Marginal Cost Economy	45
3.1	Big Is Beautiful.....	45
3.2	Zero Marginal Cost Business Models	52
3.3	When Is It Worthwhile to Start Using Digital Technologies?	59
3.4	Big Stays Beautiful.....	64
3.5	Artificial Intelligence for Editing	67
	References.....	71
4	Cloud – The Automated IT Value Chain	75
4.1	It Is the Software.....	75
4.2	The Classic IT Process	76
4.3	The Stack – IT and Its Value Chain	83
4.4	The Cloud Transformation in IT.....	85
4.5	The Cloud-Based IT Process	97

4.6	Public Cloud vs. Private Cloud.....	100
4.7	Security in the Public Cloud.....	102
4.8	Case Study: A Misunderstanding in the IT Purchasing Department of a Major Corporation.....	106
4.9	From Traditional IT to the Cloud – Explained on One Page and in One Picture	108
	References.....	110
5	Cloud IT vs. Classic IT – Calculation for Controllers	115
5.1	A Practical Example: Outsourcing Invoice Management.....	115
5.2	Features of the Classic Application	118
5.3	The Cloud Transformation of the Application.....	122
5.4	Features of the Cloud-Based Application.....	125
5.5	An Overview of the Advantages and Disadvantages of Transformation...	129
5.6	Conclusion.....	132
	References.....	132
6	Mastering Software as a Core Competence	133
6.1	Everything Becomes Software	133
6.2	Why Software Is Such a Challenge for Managers.....	135
6.3	Virtualization Layers	138
6.4	Sourcing Options	141
6.5	Software Architecture.....	143
6.6	Process Flows	150
6.7	People and Organization.....	159
6.8	Practical Example ING DiBa	163
6.9	Conclusion.....	165
	References.....	166
7	Falling Transaction Costs and the New Network Economy	169
7.1	Transaction Costs Hold Traditional Value Chains Together.....	169
7.2	Excursus: Internal Transaction Costs Slow Down Economies of Scale in Production	172
7.3	Integrators, Orchestrators, and Layer Players – How Transaction Costs Influence Economic Structures.....	174
7.4	Fast Communication and Simple Automation – The Transaction Cost Levers of Digitization.....	178
7.5	New Make-Or-Buy Decisions Through Digitalisation.....	181
7.6	The Impact of the Cloud Revolution on the Transaction Costs of Software Use.....	185
7.7	Practical Example: How Software Purchasing Via the Cloud Reduces Transaction Costs.....	189
7.8	Towards the Network Economy	195

7.9	Conclusion.....	197
	References.....	199
8	The Cloud Transformation	203
8.1	Scientific Models for Digital Transformation.....	203
8.2	The Three Levels of Cloud Transformation	207
8.3	Transforming the Infrastructure Model	210
8.4	Changing the Operating Model	220
8.5	Changing the Business Model.....	232
8.6	The Impact of Cloud Transformation on Potential Employees	236
8.7	A Successful Cloud Transformation – Explained in One Picture	240
	References.....	242
9	Cloud Transformation – How the Public Cloud Is Changing Businesses	247
9.1	Businesses Fail – Even When Managers Seem to Do Everything Right	247
9.2	Digitalisation as a Defining Trend in the Economy.....	250
9.3	Marginal Costs Determine Competitiveness	251
9.4	Cloud as a Key Technology of Digitization.....	252
9.5	Classic Applications Can Be Migrated to Cloud Technologies.....	254
9.6	Becoming Competitive for the Digital World with Software and Cloud Skills	256
9.7	Sinking Transaction Costs Lead to More Outsourcing and Change the Economy	258
9.8	Cloud Transformation Affects All Companies with Digital Value Creation – On Three Different Levels	259
9.9	Conclusion.....	262
	Index	265

List of Figures

Fig. 1.1	Comparison of market leaders in the computer value chain – mainframe vs. PC	2
Fig. 1.2	Innovator’s dilemma according to Clayton Christensen	4
Fig. 1.3	Transformative effect of cloud technologies	6
Fig. 1.4	Objective of the book	8
Fig. 1.5	Procedure of the book	9
Fig. 1.6	Gartner Hypecycle 2018 (Panetta 2018)	11
Fig. 2.1	The technical process of digitization.....	16
Fig. 2.2	Effects of digitalisation	18
Fig. 2.3	Digitization is changing economic paradigms	22
Fig. 2.4	Data collection leads to knowledge-based competitive advantages.....	23
Fig. 2.5	The value-added relationship between customer and supplier.....	25
Fig. 2.6	Digital platforms change the value creation relationships between suppliers and customers	26
Fig. 2.7	The economic power of digital platforms	26
Fig. 2.8	Projected increase in global data volume (Reinsel et al. 2018)	27
Fig. 2.9	The loyalty loop at Tesla	29
Fig. 2.10	Netflix doubles the number of Emmys won (Loesche 2017).....	30
Fig. 2.11	The network effect	31
Fig. 2.12	Two-sided markets	32
Fig. 2.13	The success factors for digital platforms	32
Fig. 2.14	Portfolio theory according to Markowitz	36
Fig. 3.1	Boston Consulting Group portfolio analysis.....	49
Fig. 3.2	Physical vs. digital products – average costs and marginal costs in comparison (Clement and Schreiber 2016).....	51
Fig. 3.3	Basic elements of the value chain	58
Fig. 3.4	Business model analysis according to Gassmann	61
Fig. 3.5	Launch of zero marginal cost business models	63
Fig. 3.6	Digital markets – market shares and number of employees.....	65
Fig. 3.7	Actual distribution of market shares in digital markets	67

Fig. 3.8	Book value chain.....	68
Fig. 3.9	Artificial neural networks.....	69
Fig. 3.10	Demo showcase on proofreading AI. (Source: Arvato Systems S4M GmbH).....	71
Fig. 4.1	The cycle of a software project.....	77
Fig. 4.2	Network of known and unknown dependencies in the IT value chain.....	79
Fig. 4.3	Irregular load curve of an application.....	81
Fig. 4.4	The IT value chain (stack).....	83
Fig. 4.5	Interest in the search term “Cloud“over time since 2004 according to Google Trends.....	86
Fig. 4.6	Schematic flow of the use of an application programming interface (API) using the example of OpenWeatherMap.org.....	89
Fig. 4.7	Example of an API call of a database.....	92
Fig. 4.8	IT value creation becomes a network.....	92
Fig. 4.9	Different levels of abstraction of cloud-based IT value creation.....	93
Fig. 4.10	Cloud enables simple focus on the core business.....	95
Fig. 4.11	Creating software using cloud services.....	97
Fig. 4.12	Operating software in the cloud.....	98
Fig. 4.13	Scaling software in the cloud.....	99
Fig. 4.14	Basic scope of services of the private cloud.....	100
Fig. 4.15	Private cloud and public cloud in comparison.....	101
Fig. 4.16	Differentiation of compliance and security.....	102
Fig. 4.17	Levels of technical safety.....	103
Fig. 4.18	Areas of responsibility for security when outsourcing to the cloud.....	106
Fig. 4.19	Infrastructure components are no longer recognizable for platform services.....	107
Fig. 4.20	From traditional IT to cloud-based IT value creation.....	109
Fig. 5.1	Business model of a service provider for “process management for purchase invoices.....	116
Fig. 5.2	Challenges of global outsourcing of purchasing invoice management.....	117
Fig. 5.3	Logical architecture of the application.....	118
Fig. 5.4	Number of transactions and monthly costs for IT.....	120
Fig. 5.5	Average cost per month and capacity limits of the old application.....	121
Fig. 5.6	Marginal costs in the old application.....	122
Fig. 5.7	Migration concept for the outsourcing application.....	123
Fig. 5.8	Monthly costs of the new application.....	125
Fig. 5.9	Monthly total operating costs including projects.....	127
Fig. 5.10	Average costs as a function of transactions.....	128
Fig. 5.11	Summed costs over the entire application life cycle.....	129
Fig. 5.12	Relevant price and quality differences in one image.....	131
Fig. 6.1	The software process accesses IT value creation.....	134
Fig. 6.2	Monolithic software contains many dependencies.....	136

Fig. 6.3	Monolithic software – the Hydra in the enterprise.....	137
Fig. 6.4	Dependencies within the software slow down the organization	137
Fig. 6.5	Factors influencing the performance of software.....	138
Fig. 6.6	Decoupling enables scaling effects	139
Fig. 6.7	Virtualization of IT value creation using the example of a container service	139
Fig. 6.8	Example calculation of a website with fluctuating usage pattern	140
Fig. 6.9	Make-or-buy question in overview.....	141
Fig. 6.10	The most important sourcing options.....	142
Fig. 6.11	Factors in the individual weighing of sourcing options	143
Fig. 6.12	Client-server architecture – Downloading a photo from the FTP server ...	144
Fig. 6.13	Multi-layer architecture.....	145
Fig. 6.14	Service Oriented Architecture (SOA)	145
Fig. 6.15	Microservices architecture	146
Fig. 6.16	Challenges with distributed systems	146
Fig. 6.17	Reduction of dependencies and complexity.....	149
Fig. 6.18	From monolith to microservices – economic impact.....	150
Fig. 6.19	Process flows from the idea to operation	151
Fig. 6.20	Agile as incremental and collaborative software development.....	152
Fig. 6.21	Agile approach is particularly well suited for non-material goods.....	153
Fig. 6.22	Scrum as a successful model at the beginning of software value creation.....	155
Fig. 6.23	Classical process of software deployment with high communication and administration efforts	155
Fig. 6.24	DevOps as an agile form of IT delivery	157
Fig. 6.25	DevOps – the four characterizing terms.....	158
Fig. 6.26	Agile working with squads, tribes and chapters.....	164
Fig. 7.1	The types of transaction costs – example engine production.....	171
Fig. 7.2	High transaction costs hold the value chain together.....	172
Fig. 7.3	Comparison of additional costs incurred in the context of the product	173
Fig. 7.4	Internal transaction costs increase with rising output volume	173
Fig. 7.5	Falling communication costs according to Philip Evans (Evans 2013)	179
Fig. 7.6	Reduced transaction costs through digitization – example of share trading	180
Fig. 7.7	Core business between digitization and automation	182
Fig. 7.8	Exploiting the benefits of the cloud with low transaction costs.....	185
Fig. 7.9	Core competencies and core assets	187
Fig. 7.10	The digital make-or-buy decision: Exemplary positioning for a company with physical products and increasing relevance of digital business models.....	187
Fig. 7.11	High internal transaction costs in traditional IT.....	190
Fig. 7.12	Low external transaction costs in the use of software services.....	192

Fig. 7.13	On the way to the network economy: exemplary representation of the dissolution of classic value chains through falling transaction costs in the digital economy	195
Fig. 7.14	From traditional to network value creation	197
Fig. 7.15	Transaction costs falling due to cloud technologies are changing the corporate world	198
Fig. 8.1	Three Horizons of Growth according to McKinsey and Baghai, Coley & White	204
Fig. 8.2	Zone to win according to Geoffrey Moore.....	206
Fig. 8.3	Levels of disruption according to Geoffrey Moore.....	207
Fig. 8.4	Preparation phase of the cloud transformation.....	208
Fig. 8.5	Cloud strategy team: Organizational structure and expected scope of change per level.....	210
Fig. 8.6	The four steps of cloud transformation in the infrastructure model.....	210
Fig. 8.7	The 5Rs according to Gartner: Application migration scenarios	211
Fig. 8.8	Analysis of the application landscape before a cloud migration to Microsoft.....	212
Fig. 8.9	Evaluation and prioritization of the application landscape according to Briggs/Kassner	214
Fig. 8.10	Required skills per migration type	214
Fig. 8.11	Framework for Governance, Risk and Compliance according to Michael South (AWS) simplified and translated.....	216
Fig. 8.12	Procedure for application migration to Microsoft.....	218
Fig. 8.13	Implementation of the cloud transformation in the infrastructure model.....	219
Fig. 8.14	Transforming the infrastructure model – the basic steps of cloud transformation	220
Fig. 8.15	Using the cloud to improve business models	221
Fig. 8.16	Migration type and opportunities for the business model	222
Fig. 8.17	Migration effort and benefit factors	223
Fig. 8.18	Costs versus benefits of a cloud migration.....	225
Fig. 8.19	Consistent focus on the customer.....	225
Fig. 8.20	Levels of enterprise applications according to Rava Kalakota	227
Fig. 8.21	Feature team for “Detecting hate messages” – exemplary composition of a team.....	228
Fig. 8.22	Modernizing the operating model with cloud technology requires real changes in the company	232
Fig. 8.23	Transformation as a management task according to Geoffrey Moore	233
Fig. 8.24	Zone Offense – Acting as a Disruptor according to Geoffrey Moore	234
Fig. 8.25	Zone Defense – The Disruption Encounter according to Geoffrey Moore.....	235
Fig. 8.26	Public cloud transformation – summary of the most important points per level	241
Fig. 9.1	Cloud transformation – How the public cloud is changing companies.....	248

Fig. 9.2	Innovator's Dilemma according to Clayton Christensen using the example of "Mainframe Computer versus Personal Computer"	249
Fig. 9.3	Cloud as digitization of IT	249
Fig. 9.4	Cloud technologies as a multiple disruptive factor	250
Fig. 9.5	Digitalisation is changing economic paradigms	250
Fig. 9.6	Success factors in the digital world.....	251
Fig. 9.7	The emergence of zero marginal cost business models with simultaneous digitization of production, product and sales	252
Fig. 9.8	Digitization of software processes through the cloud	253
Fig. 9.9	Concrete economic effects of the cloud transformation.....	254
Fig. 9.10	Conversion of a simple application to Cloud Native.....	255
Fig. 9.11	Cloud transformation of a business model-relevant application	256
Fig. 9.12	Software value creation as a factor in digital competition	256
Fig. 9.13	Relevant factors influencing the performance of software value creation.....	258
Fig. 9.14	Transaction costs are the glue that holds companies together	258
Fig. 9.15	Falling transaction costs are changing the corporate world	259
Fig. 9.16	Levels of disruption according to Geoffrey Moore	260
Fig. 9.17	Change infrastructure model	260
Fig. 9.18	Modernize operating model	261
Fig. 9.19	Transform total portfolio	262

List of Tables

Table 5.1	Calculation of the old application.....	119
Table 5.2	Changed cost structures in the new application.....	124
Table 5.3	Overview of migration efforts.....	125
Table 5.4	Calculation of the new application for three million transactions	126
Table 5.5	Comparison of the most important cost components	130



Do You Remember Daimler, RTL and Siemens?

1

Abstract

Infrastructural revolutions usually have a major impact on companies: The steam engine, electric power, and the personal computer radically changed the way business was done. Today, companies are facing such a revolution again with cloud technology. The difference to the previous upheavals is the speed with which the changes can and must be adapted today. And this does not only affect software and IT companies but almost all companies and industries. This puts the employees involved in a tricky situation. Because on the one hand, many company leaders have understood that they have to deal with the topic of cloud transformation – and do so actively. At the same time, many managers do not know how to approach this process. The goal of this book is to provide managers with a guide to cloud transformation. The first chapter explains the topic corporate disruption through so-called disruptions and puts it in a historical context. Additionally, it provides an overview of the most important topics of the book.

1.1 Introduction

Do you still remember Daimler, RTL, and Siemens? At first glance, this question makes little sense. After all, all three companies are doing well – at least for the moment. But in just a few years, this question could well be justified. And if not for these three, then for many other companies that have not dared to change.

In 2018, General Electric, the last founding member, had to leave the American Dow Jones stock index. Since 1976, the composition of the Dow Jones has changed almost

completely.¹ The most expensive companies in the world today operate digital business models: Apple, Amazon, Alphabet (Steinharter 2018). On the other hand, companies like Kodak, Motorola, Netscape, and Nokia are cautionary examples: They show how quickly companies that have long claimed large market shares in innovative industries can disappear from the market in a very short time.

Now, a critical reader will object that serious management errors were committed in these companies mentioned and that their exit from the market was therefore unavoidable. That is correct. But it is also true that these companies were run by experienced managers who had put all their knowledge on the line to keep their organizations on track for success.

The starting situation for many of these companies was quite comfortable: they knew their markets; they knew their customers and they knew which products customers would want in the future. This accumulated knowledge was precisely the reason why they ultimately vanished. Sounds paradoxical? It is.

1.2 The Innovator's Dilemma Can Affect Any Company

The American economist Clayton Christensen described this phenomenon as early as 1997 in his book *"The Innovator's Dilemma: When New Technologies Cause Great Firms to Fail"* (Christensen 1997). Christensen refers to the innovator's dilemma as the trap into which companies fall when they respond too precisely to customer wishes – because this approach makes them victims of progress.

IBM is a prime example of this dilemma: For more than two decades IBM dominated the market of large-scale computing systems (the so-called mainframes). The company covered the entire value chain, from the manufacture of the processors to the design, the production, the manufacture of the software, and the distribution of the mainframe systems (see Fig. 1.1).

During IBM's period of dominance in mainframe computing, data storage continued to grow. As an example, Christensen cites the IBM 305 RAMAC mainframe computer,

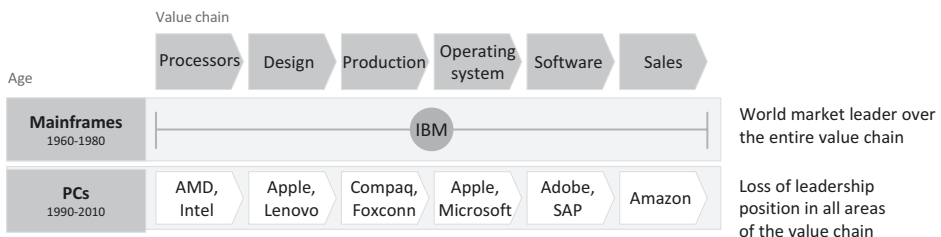


Fig. 1.1 Comparison of market leaders in the computer value chain – mainframe vs. PC

¹Exxon Mobile is the only company that has been around longer. The oil company has been listed in the Dow Jones since 1928.

which had 4.38 Mbytes of memory and cost about \$200,000 (USD) in 1956 (THOCP 2011), equivalent to about \$1.9 million today.² IBM planned to produce 1800 units of this model. Highly skilled staff were needed to set up, run and operate such a computer, and it was also required to invest additionally in premises, cooling systems and power systems. Few firms could afford this, and vendor companies – such as IBM – were able to generate large, low-risk revenues and high profits with their business model. So, what sealed IBM's demise in the computing branch?

The answer was the appearance of a disruptive product. In the book “The Innovator's Dilemma“, Clayton Christensen distinguishes between two product categories: sustaining technologies and disruptive technologies.

The difference between the two product categories is that disruptive technology is initially ridiculed when it first appears on the market. This is because market participants – and above all potential customers – underestimate the market-changing power of the products at the beginning.

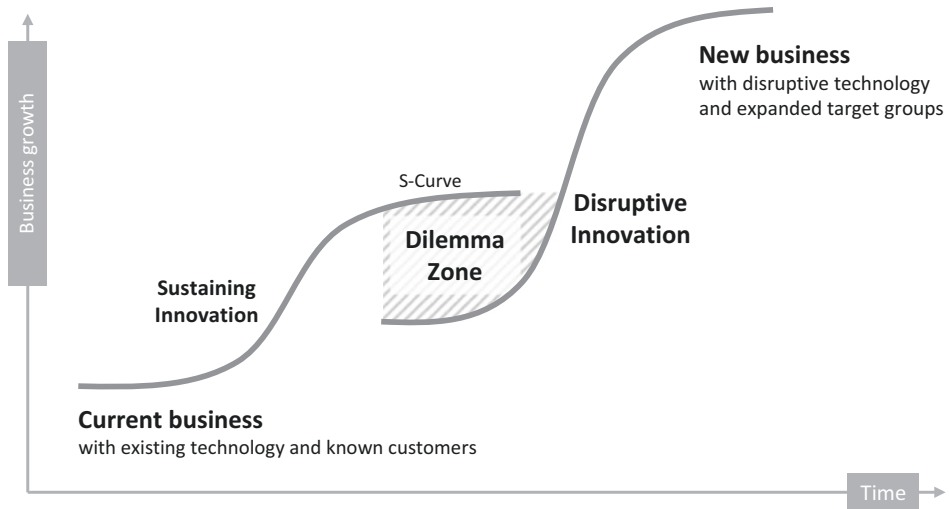
However, the assessment of customers changes over time. With increasing success, disruptive technologies change the market logic of entire industries (Fleig 2017). Players leave the market, new players enter the market. The production, distribution and the product itself change. In the end, everything changed in the affected industry.

The process in which disruptive products replace the prevailing (sustaining) products always follows the same pattern: Initially, the new (disruptive) products are hardly marketable. They are discovered by so-called “early adopters”, i.e. customers who are enthusiastic about new products and technologies or who use them for themselves in specific application areas. At this early stage, the performance and ease of use of the new product are still far below the performance of the prevailing product. In this so-called dilemma zone (see Fig. 1.2), it is simply not rational for the previously successful company to enter such a market (Harrison 2018). This is the reason why established companies miss their opportunity.

This is exactly what happened to IBM when personal computers (PCs) appeared on the market. The technology and market-changing power of a computer that fits on a desk were simply underestimated. IBM was generous enough (or from today's perspective: insane enough) to give the marketing rights of the freshly developed operating system for personal computers called MSDOS to a fledgling startup company. For \$75,000 this startup had previously bought the QDOS operating system from Seattle Computer Products and renamed the operating system to MSDOS (Borchers 2011). The owner of this company was Bill Gates, and the company is called Microsoft. And just because of the mistake of IBM, Bill Gates became one of the richest people on earth today!

The first PCs still had to be soldered together by the customers. Steve Jobs and Steve Wozniak – the two founders of Apple – initially refused to supply ready-assembled PCs to stores (Vollmer 2018). From their point of view, already assembled computer violated the principle of the product: They wanted to offer a tech-savvy fan community a new toy to play with.

²The calculation was made with the help of the inflation calculator [fxtop.com](https://www.fxtop.com)



Innovator's Dilemma According to Clayton Christensen

Fig. 1.2 Innovator's dilemma according to Clayton Christensen

After discussions with a local dealer, Apple finally offered the “Apple I” in 1976 for 666 USD. The following year, the Apple II followed. The price was 1300 USD (equivalent to about 2600 USD in today's purchasing power). The computer was inexpensive, already assembled, and much easier to use. The Apple II cost only about one to two percent of the price of a mainframe. Margins were only 34% in the PC business compared to 56% in the mainframe business (Christensen 1997). As early as 1979, Apple sold 35,000 units of the new model, and just a few years later, billions of PCs populated users' offices and desks around the world. According to research by market research firm Gartner, there were nearly 1.5 billion installed PCs worldwide in 2016 (Gartner 2016). At the same time, the sales model changed from B2B to B2C, investments in a new type of marketing and sales were necessary, and customer-specific consulting became unnecessary.

From one moment to another, IBM lost its business model. Why should a company still afford large-scale computer systems when data processing could just as easily take place decentrally on desktop PCs?

IBM has long since emerged from the deep valley it had to walk through after partially losing its business model. In addition to the traditional business model with large-scale computing systems, consulting and services became increasingly important. IBM said goodbye to the unprofitable PC business in 2004 and sold the division to Lenovo (Windeck 2014). Simultaneously, IBM became one of the largest digital consulting firms and one of the most important providers of external data centers in the world. However, the company did not succeed because it stuck to sustaining technologies, but because it reinvented itself

and its products. However, the danger of misjudging developments is not banished for a company even once it has extricated itself from the innovator's dilemma. Particularly in the area of data center services, IBM is once again caught up in an innovator's dilemma thanks to disruptive cloud technologies and is trying to extricate itself from this dilemma by buying RedHat (Grüner 2018).

The product history of recent decades is full of examples of how disruptive technologies can replace and supersede established technologies on markets. When the first mobile phones came onto the market in the early 1980s, they were ridiculed around the world. The old (sustaining) technology "telephone" seemed to suffice for daily needs. After all, if the user wanted to make a call while on the move, there were telephone booths. In Germany, an anti-cell phone sentiment virtually broke out; users of mobile communication devices were vilified for years as "yuppies" (Hackmann and Bremmer 2012).

Young companies at the time, such as Nokia, quickly succeeded in replacing the bulky devices of the early days with much smaller mobile phones that were suitable for the mass market. In 1994, just 4.6% of Germans had a mobile phone contract. Ten years later, the share had risen to 86.4% (Bundesnetzagentur 2018).

The irony of the story is that Nokia itself became a victim of the "Innovator's Dilemma" a few years later. With Apple's iPhones, a new product category had appeared on the consumer market in 2007 that revolutionized the way mobile devices were used. Today, smartphones from Apple, Samsung, and Huawei dominate the mobile markets, with 5.8 billion mobile phones forecast worldwide by 2025 (GSMA 2019). Do you still remember Nokia?

1.3 Disruptive Technology – Public Cloud

Numerous established companies are currently falling into the trap of the Innovator's Dilemma. This time, the disruptive and thus initially easy-to-underestimate technology is called the "cloud". This refers to a technology that enables the decentralized, automated provision of computing power, storage, and other IT components. As in the scenarios described, cloud technology has the disruptive power to fundamentally change markets and business models.

Cloud approaches – similar to other infrastructural innovations of the last centuries – will revolutionize business due to their ease of use. To "spoil" the thesis of this book: The cloud – if used appropriately – is the entry point for companies into the digital age. And this applies to all levels: From the company's fundamental business model to the manufacture and distribution of the product to the internal collaboration of employees (see Fig. 1.3).

The disruptive possibilities of cloud technology were already recognized in the 1950s by Herb Grosch, an employee of IBM (Hühn 2018). He dreamed of no longer storing computing power in a stationary location, but of handing it over to huge external computing facilities.

Technically, the construction of a decentralized computing power network was already possible at the time when Herb Grosch had the idea. However, the necessary technical

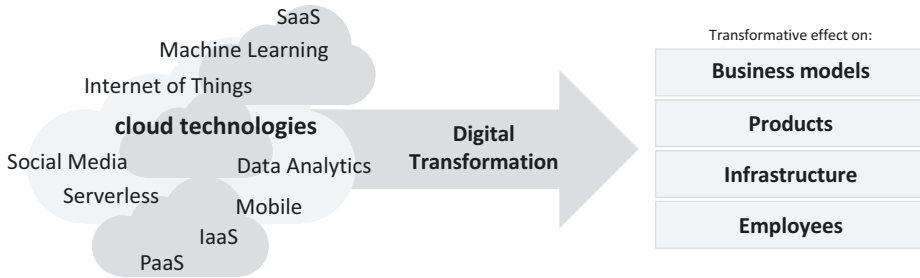


Fig. 1.3 Transformative effect of cloud technologies

bandwidths were lacking to transmit the data at an acceptable speed via the telephone network and thus to be able to use the distributed computing power efficiently. Only when broadband technology became widespread it was possible to create a decentralized network in which every provider could feed computing power into the network and make it available for a fee (Lauchenaer 2016).

This laid the foundation for the economic success of cloud technology. An important driver behind this development was the company ‘Salesforce’, which succeeded in offering business software as packages on the net (so-called software-as-a-service). Services such as software for managing customer data (CRM) no longer had to be planned and ordered in a lengthy process but were available online with a few clicks. Just as smooth as customers use Spotify today.

Since then, Internet giants such as Amazon, Microsoft, and Google have been building huge data center – the so-called hyperscalers – at various locations around the world. On these sites with the size of several football fields, thousands and thousands of microcomputers are connected to a network and connected to the grid. Similar to a power grid, the capacities of these data centers can be ramped up or down depending on the workload.

A current example of the application scenarios that are possible with the help of cloud technology is provided by Alphabet, Google’s parent company. In 2019, Alphabet entered the highly competitive market for game consoles with a software streaming service called ‘Stadia’. Stadia illustrates the disruptive potential of cloud technology: Users of this service no longer need to rely on purchasing a powerful gaming console – all they need is a fast internet connection, a monitor, and an input device. The computing power comes from the network. This allows gamers to access high-quality games with lavish graphics anywhere in the world. With just a few clicks, the service is ordered, and the provisioning and billing of the service are automated (Heuzeroth 2019).

Despite all these advantages, cloud technology has not yet fully taken hold in Europe. The recommendation by consultants to invest more resources in the implementation of cloud technology still triggers trepidation in boardrooms here (Holland 2016). On the one hand, managers intuitively feel that this trend will play an important role in the future. At the same time, they prefer to leave this field to IT managers and CIOs, technical directors (CTOs) or simply the ‘shadow IT’. Shadow IT is the hidden IT organization that develops

in companies when the official IT department does not meet the needs of the business departments for new functions and solutions. Users from specialist departments such as marketing, production, or logistics then use the cloud offerings available on the Internet – usually bypassing internal regulations and information obligations – to solve their specialist problems themselves (Manhart 2015).

So, it's no surprise that the potential of cloud technology so far has been lying fallow in many places in Europe. However, this is not a specifically European problem – on other continents, too, only a few companies have recognized the possibilities of the technology and pushed them forward with vehemence. The pioneers in this field are the USA, and here in particular the large Internet companies on the American West Coast such as Google, Amazon, and Salesforce. But China, too, is vigorously pushing the “cloudification” of domestic companies from the government side (see Chap. 2).

Metaphorically speaking, with cloud technology a wave of digitization is rolling towards companies, and like non-swimmers, they are waiting with their eyes wide open for the impact. They have understood that the wave is big and will carry them along, but they do not know how to deal with this fact. This scenario can be observed with drowning victims: they behave intuitively wrong in this situation. Instead of reaching out for the life preserver, they push it away, hold their breath and stop swimming.

1.4 The Aim of This Book: Surfboard Instead of a Lifebelt

This book is aimed at those who want to ride the wave of digitization. Therefore, everything in this book revolves around the opportunities of cloud technology. It holds the potential to adapt the product range to the conditions of digitization. It helps thinking about the development of new digital business models in the shortest possible time. And answers also the question how to put them online – without major investment risks.

The book “*Cloud Transformation – How the Public Cloud is Changing Businesses*” helps companies help themselves. It enables the responsible persons to recognize the potential of cloud transformation and to use it for their own company.

It describes the most important methods and tools of software development and analyzes their effect on the transaction costs and marginal costs. Based on these findings, a concrete guide for cloud transformation is developed that helps corporate leaders to initiate the right steps to digitize their business. In this way, the book provides the foundations for catching the approaching wave of digitization (see Fig. 1.4).

In this sense, this book is not functioning as a life preserver. Rather, the contents resemble a surfboard that helps companies ride the oncoming wave. Is surfing easy? No, it has to be learned. The best surfers in the world train hard and a lot. Only if a company is willing to engage in the process of cloud transformation and has the necessary enthusiasm and perseverance the process can ultimately be successful.

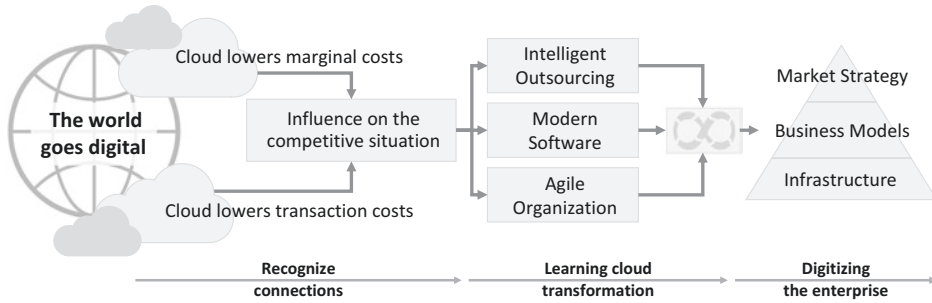


Fig. 1.4 Objective of the book

1.4.1 Methodological Approach

Consultants everywhere are currently promising the all-round digitization of companies in the shortest possible time – for example, in just 18 months. These promises leave IT experts and CIOs somewhat perplexed. How is such a concept supposed to work? Will all departments be turned upside down for a few months and on the deadline date the board of directors will press the “all-digital” button?³

If you want your business to go digital in no time, try this: Just take out your credit card and visit the website of Azure or AWS, the cloud offerings from Microsoft and Amazon, respectively. After selecting the free trial month, you can configure and deploy your own server within minutes. You don’t need any training to do this, just follow the instructions. With about 20 clicks you have digitized your IT processes – in 30 min.⁴

In many cases, the suggestions for digitization from consultants resemble the diet tips that can be found in fitness magazines. There, suggestions are made (“The new pineapple diet”) without developing a basic understanding of the mechanisms of human metabolism in those interested in dieting.

This book does not provide simple recipes and does not prescribe which goals companies must achieve in which timeframe. Rather, it is about understanding the fundamental interrelationships of the digitalized economy. Or to remain in the diet analogy: The reader should understand how the digital metabolism works and what the cloud means for the fitness of a company. First of all, companies have to accept digitization as a driving force for the development of their future business models. Afterwards they have to understand the underlying mechanisms of their IT systems. From that point on companies can successfully lose fat and build muscle.

³On August 25, 1967, during a live broadcast from the Berlin Radio Exhibition, then-German Chancellor Willy Brandt pressed a red button to start color television in Germany. However, the technicians responsible for the switchover were a bit overzealous, so the new hues were visible on the screens seconds before the button was pressed.

⁴For instructions on how to perform a free cloud server installation in 30 min, see (Tamm and Frank 2019).

Therefore, this book starts with the presentation of the theoretical basics, from which practical solution scenarios are subsequently derived. The reader is not told whether he or she should choose cloud provider A or B. Rather, the reader should understand where the advantages of the cloud lie and what to look out for in cloud transformation.

With this approach, the book addresses two target groups: On the one hand, it is intended to be a guide for practitioners who are entrusted with the task of cloud transformation. These are managing directors, IT managers, and HR employees. It does not matter whether the company is a medium-sized enterprise or a large global corporation. The basic measures derived from the theoretical preliminary considerations apply to all company sizes and across all industries.

In addition, the book is aimed at researchers and scientists who deal with the topic of cloud transformation. For them, the book offers numerous models and computational examples of their own, which enable a scientific classification of the topic. At the same time, the book connects already established ideas and models, enabling interested researchers to take up the topics and work on them further.

1.4.2 Guide through the Book

The structure of the book is based on the “Golden Circle” by the British-American author Simon Sinek. His theory is that the basis of every strategic decision should be the answers to the three questions “Why do we do something?”, “How do we do it?” and “What do we do?” (Sinek 2014).

Only when you have understood “why” you should engage with cloud technology then you can deal with the “how” – i.e. the measures to be taken – and the “what”, i.e. the processes that need to be initiated (see Fig. 1.5).

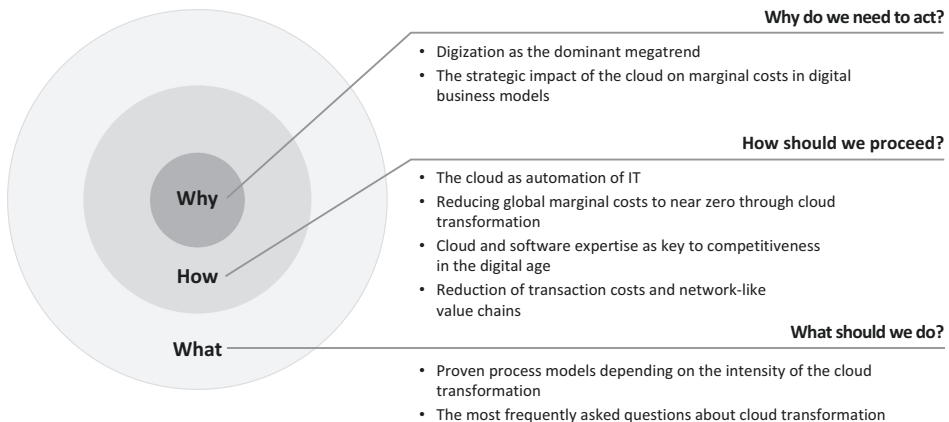


Fig. 1.5 Procedure of the book

Chapter 2 deals with the question of why: Why is digitization such a powerful force that is sweeping over companies? In short, digitization is disrupting the world of business. All products that can be digitized will be digitized in the coming years – or already have been. If digitization of the core product or service is not possible, all process steps around the creation and distribution of the product will be digitized.

Chapter 3 sheds light on the marginal cost analysis. Whereas for product categories such as cars, marginal costs generally only decrease with very large production volumes and very slowly, digital “**zero marginal cost products**” enable almost infinite scaling.

Chapters 4, 5, 6 and 7 provide an answer to the question “How should we proceed?”. Digital business models require software and this software must be created, operated, and scaled. With the help of the cloud, this can be turned into globally scalable zero marginal cost businesses.

Chapter 4 introduces the challenges of classic IT value creation and explains how the cloud is revolutionizing this very value creation. The most important virtualization stages of the cloud are presented and terms such as API and microservices are explained in a way that is understandable for the technical “noob”.

In Chap. 5, the cloud transformation is illustrated concretely using a classic application. The accompanying cost analysis shows how a fixed-cost-intensive, monolithic application can become a globally scaling cloud application with marginal costs close to zero. Chapter 6 describes the most important competencies that companies should have if they want to successfully use the software at the core of their digital business model.

Chapter 7 describes how cloud technologies and methods relevantly reduce transaction costs. Outsourcing is thus becoming easier and less risky, and the trend towards outsourcing secondary IT value creation is becoming mandatory. The focus of companies on specialized but globally scalable services leads to a network economy in which even small companies can survive.

Chapter 8 illuminates the necessary processes in cloud transformation. The implementation principles are only touched upon here, as more concrete explanations of the details of possible cloud transformations would go beyond the scope of this book. Chapter 9 concludes by presenting the theses and findings of the book.

Thus, this book integrates three perspectives that are usually described separately: Economics, Technology, and Organizational Development. The decision whether and when a far-reaching transformation of a business model is necessary can be identified by a marginal cost analysis of the distribution and production of a product – it lies therefore in the realm of economics. Whether a company is capable of offering its product at a competitive marginal cost depends largely on how well it can develop, operate and scale software – this is where technology comes into play. Finally aligning the company with its people, leadership, processes, culture, and collaboration to the new digital business models is an organizational development issue.

Every year, the market research company Gartner publishes a report on the development status of disruptive technologies. In doing so, Gartner uses an interesting approach: