# CUSTOMER INTERACTION IN THE TELCO INDUSTRY

TREND REPORT 2017

**CDTM** CENTER FOR DIGITAL TECHNOLOGY AND MANAGEMENT

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**CDTM** CENTER FOR DIGITAL TECHNOLOGY AND MANAGEMENT

### A project of the Center for
### Digital Technology and Management (CDTM)

The Center for Digital Technology and Management (CDTM) is a joint, interdisciplinary institution for education, research, and entrepreneurship of
the Ludwig-Maximilians-Universität (LMU) and
the Technische Universität München (TUM).

It offers the add-on study program „Technology Management" for students from various backgrounds, which provides students with tools and knowledge at the intersection of business and digital technologies.

The entire trend report was written by CDTM students under the close guidance of research assistants. For more information about the CDTM and its related projects, please visit www.cdtm.de.

# PREFACE OF THE EDITORS

As Herman Kahn, one of the founding fathers of modern scenario planning, nicely states, it is tremendously important for strategy and policy makers to get a deep understanding of possible future developments in order to be prepared for them.

The Center for Digital Technology and Management (CDTM) aims to empower innovators of tomorrow. It is our mission to equip our students with the tools and knowledge they will need to become responsible leaders, who actively shape their future environment, rather than only react to changes.

This trend report is the result of the course Trend Seminar, which is part of the interdisciplinary add-on study program in Technology Management at CDTM. About 25 selected students of various disciplines, such as Business Administration, Economics, Psychology, Computer Science, Electrical Engineering, and others, work together on a relevant topic related to ICT. Over seven intense weeks of fulltime work, the participating students dive deeply into the topic of the Trend

> **Everybody can learn from the past.
> Today it is important to learn from the future.**
>
> Herman Kahn

Seminar. Working in several interdisciplinary sub-teams, students apply the knowledge from their main studies and learn new perspectives from their team members. They conduct trend research, develop scenarios of the future, generate ideas for innovative products or services, and detail them out into concrete business concepts.

We would like to take the chance to thank everyone who contributed and made this CDTM trend report possible: We

want to thank Vodafone GmbH for supporting this Trend Seminar. Particularly, we want to thank Thorsten Weber for his great interest in the topic, the valuable insights and feedback throughout the whole project, and the collaborative organization and topic definition of this Trend Seminar.

In addition, we very much thank all our lecturers, who shared their knowledge and largely contributed to this project's success:

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Last but not least, we would like to thank the CDTM students of the class of Fall 2017. They put great energy and enthusiasm into this project, which made it a pleasure for us to supervise the course and coach the individual teams.

Gesa Biermann and Florian Lachner
Center for Digital Technology and Management

# PREFACE OF THE PROJECT PARTNER

Telecommunications is an essential service used by over seven billion mobile customers and 0.9bn broadband users across the globe. The average smartphone owner uses the device 3-4 hours daily. Messaging has grown exponentially, with 63bn WhatsApp messages being sent around on New Year's Eve 2016. The importance of telecommunication at Vodafone, however, goes further: our purpose is to connect everybody to live a better today and build a better tomorrow. Telecommunications is no longer only about connecting people. Digital technologies are enabling an ever more connected world of machines and everyday devices. The era of the so-called Internet of Things has just begun. Ubiquitous connectivity allows digital services and data to become more readily available and convenient for consumers. Enterprises are able to optimize and automate processes at large scale. This opens up new potentials of leveraging insights on customer behavior and data monetization. Chatbots have started to change customer interaction and algorithms based on big data allow companies to target customers with highly tailored offerings.

Increasing digitization, however, also leads to new and different customer expectations with regards to their interaction with telco providers. Digital natives especially are demanding in terms of customized products and services. What business models can evolve from this new digital customer interaction? What are winning propositions and how can telcos best monetize these opportunities?

By reading this report, the telco-affine reader will explore some creative ideas how telco operators could re-think their

**" The Future is exciting. Ready? "**

interaction with customers, and also gain insights how to transfer these opportunities into new revenue streams.

The enclosed research findings from our collaboration with the Center for Digital Technology and Management (CDTM) provided us at Vodafone Germany with a selection of disruptive ideas that we can build upon to generate growth from new business models and avoid becoming a mere data connectivity provider, the so called "bit pipe". Our aim is to explore and scale business models that build upon our core competence of connectivity and extend our scope to become a "smart pipe" telco provider.

We would like to take the opportunity to thank everyone who contributes to the mostly-awesome-spirit that emanates from the Center. Thanks to its interdisciplinary approach, the CDTM proved once more to be a vibrant hub for the vital exchange between academia, entrepreneurs, and corporate

practitioners. It was a pleasure to experience the energy surrounding the CDTM throughout seven intense weeks. While our joint focus was to create a good understanding of possible future developments, and to develop a handful of future-proof business model concepts, we soon grasped the significance of the CDTM culture as a key enabler for creativity.

Our thanks go to all students whose complementary skills, energy, and drive created a fruitful collaboration atmosphere and who inspired us to think outside the box.

Our warm thanks also go to Gesa Biermann and Florian Lachner for their smooth organisation, motivation for telecommunications, and for their continuous support.

Matthias Krömer and Thorsten Weber
Vodafone Deutschland GmbH, Dusseldorf

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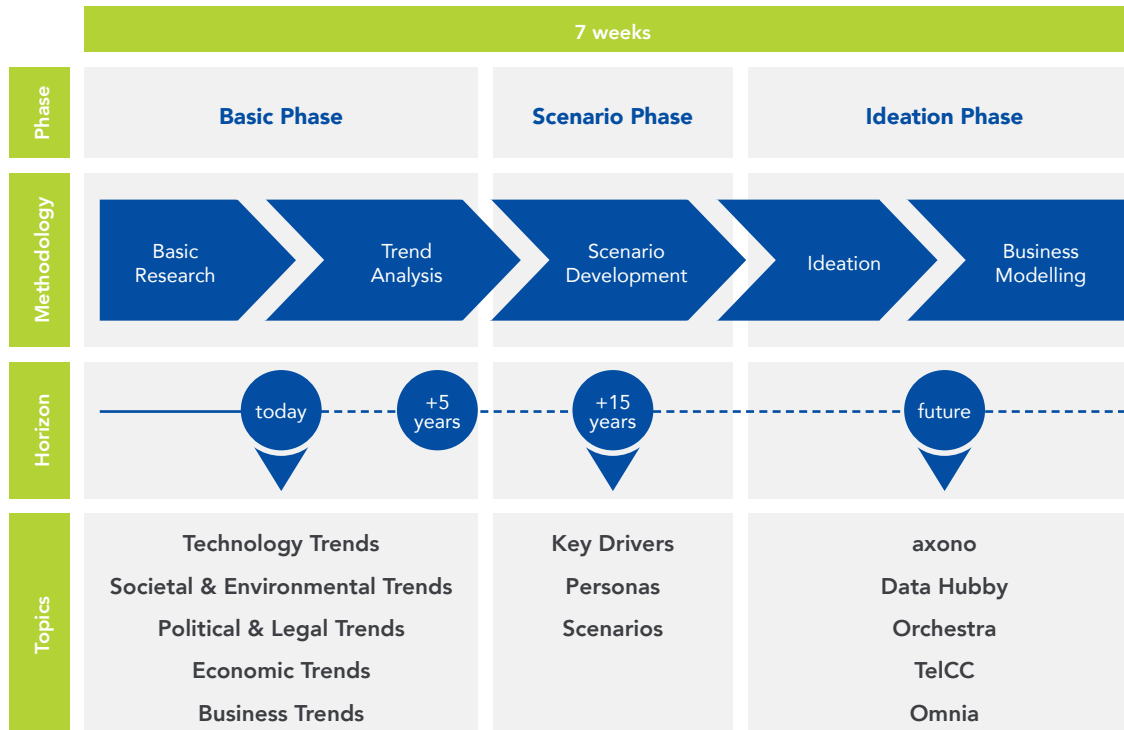
# TRENDS

# SCENARIOS

# IDEATION

# METHODOLOGY

For a given topic that is highly impacted by digital technologies, the Trend Seminar pursues three main goals:

- To analyze the status quo, recent developments and identify important trends
- To develop extreme scenarios of the future, in order to be prepared for upcoming challenges
- To develop future-proof product and service ideas and detail them out into business concepts.

These goals are represented by the three phases of the trend seminar: The Basic Phase, the Scenario Phase and the Ideation Phase.

Twenty-six students, supervised by two doctoral candidates, pursue the Trend Seminar in seven weeks of intensive full-time work alongside with their project partner. In each phase, interdisciplinary subteams are formed including students from technology, business, and various other backgrounds to combine versatile ways of thinking.

The **Basic Phase** yields a holistic overview on recent developments and trends in the environment of the overall topic. Based on the commonly used STEP approach (Social-Technological-Economic-Political), the status quo and trends in the fields society & environment, technology, economics, politics & legal, as well as emerging business models are analyzed. Knowledge is gathered by literature research, preceded by a series of input presentations by experts on the topic.

The class is split into five teams, each working on one of the thematic scopes. At the end of the Basic Phase, the teams present their key findings to each other in order for everyone to get a holistic view on the topic to build upon in the following phases.

The **Scenario Phase** builds upon the analyzed trends in order to create four extreme scenarios of different futures in twenty years ahead. Driving forces behind developments are identified and specified as drivers with bipolar extreme outcomes. Once specified, all drivers are ranked according to their respective impact on the overall topic and the perceived degree of uncertainty regarding their outcome. Two key drivers that are independent from one another and have both a high impact and a high degree of uncertainty are chosen and, with their bipolar outcomes, used to create a scenario matrix of four extreme scenarios. A timeline for each of the scenarios is created and the scenarios are sketched out using persona descriptions and visualizations. The Scenario Phase starts with a two-day workshop followed by group work in four teams. Teams are newly formed in order to include experts from each subtopic of the Basic Phase in each new Scenario Team.

In the third phase, the **Ideation Phase**, the goal is to develop innovative business concepts, which are then tested against the previously developed scenarios. Within a two-day workshop on structured ideation following the SIT approach (systematic inventive thinking), a large number of business ideas are developed.

Out of these, the most promising five ideas are selected and further developed into detailed business concepts. The business model canvas by Alexander Osterwalder and Yves Pigneur serves as the base structure.

At the end of the seminar, the business model concepts are presented to the project partner and guests.



| | 7 weeks | | |
|---|---|---|---|
| **Phase** | **Basic Phase** | **Scenario Phase** | **Ideation Phase** |
| **Methodology** | Basic Research → Trend Analysis | Scenario Development | Ideation → Business Modelling |
| **Horizon** | today — +5 years | +15 years | future |
| **Topics** | Technology Trends<br>Societal & Environmental Trends<br>Political & Legal Trends<br>Economic Trends<br>Business Trends | Key Drivers<br>Personas<br>Scenarios | axono<br>Data Hubby<br>Orchestra<br>TelCC<br>Omnia |

# LIST OF ABBREVIATIONS

**2FA**
Two-Factor authentication

**AI**
Artificial Intelligence

**API**
Application Programming Interface

**AR**
Augmented Reality

**B2B**
Business-to-Business

**B2C**
Business-to-Customer

**bn**
Billion

**CAGR**
Compound Annual Growth Rate

**CAPEX**
Capital Expenditure

**EU**
European Union

**EUR**
Euro

**GB**
Gigabytes

**Gbps**
Gigabit per Second

**GDP**
Gross Domestic Product

**GDPR**
General Data Protection Regulation

**IIoT**
Industrial Internet of Things

**IoT**
Internet of Things

**k**
Thousand

**m**
Million

**M2M**
Machine-to-Machine

**MFA**
Multi-Factor Authentication

**ML**
Machine Learning

**NLP**
Natural Language Processing

**OECD**
Organisation for Economic Co-operation and Development

**OTT**
Over-the-top

**SA**
Smart Assistant

**SaaS**
Software-as-a-Service

**SDK**
Software Development Kit

**SME**
Small and Medium-Sized Enterprises

**Telco**
Telecommunication

**tn**
Trillion

**UI**
User Interface

**UX**
User Experience

**US**
United States of America

**USD**
US Dollar

**VR**
Virtual Reality

# TRENDS

The following chapter lists current trends that have a strong impact on the customer interaction of the telco industry. In accordance with the Basic Phase methodology, trends and related driving forces are structured in five areas: technological trends, societal and environmental trends, legal and political trends, economic trends and business model trends.

# TECHNOLOGY TRENDS

## SHAPING THE FUTURE OF CUSTOMER INTERACTION IN THE TELCO INDUSTRY

Smart Assistants

Internet of Things

Predictive Customer Care

Smart Authentication and Payment Methods

Augmented Reality

Online Personalization

# TECHNOLOGY TRENDS

## Shaping the Future of Customer Interaction in the Telco Industry

The telecommunication (telco) industry has witnessed dramatic growth and innovations in the past years, due to developments in mobile hardware and connectivity. Yet, to stay on top in an ever-competitive market, telco companies are looking to enhance their customer interaction by employing emerging technology trends. Especially in the digital customer interaction, the following trends have the potential to revolutionize customer interaction: The recent developments in Natural Language Processing (NLP) will affect the telco industry in a variety of ways. Customer care centers can employ automated answering programs, so called chatbots, to provide customers with up-to-date support around the clock. Customers are also adopting the use of personal Smart Assistants (SAs), such as Amazon Echo, potentially opening up an easy path into the center of each customer's digital environment for telco companies among others.

Since customers will communicate more and more with smart systems, the IoT is another trend that will have an enormous impact on every part of our life. The era of connectivity now also encompasses everyday objects and therefore, together with an improved network coverage, enables new possibilities for data collection and analysis for more efficiency in a lot of areas.

With the exponential growth of the world's data volume, organizations are looking for ways to act on this data to optimize the customer care process and reduce customer complaints. The technological advancements in Machine Learning (ML) technologies are allowing predictive customer care to correctly anticipate customers' needs and problems. The telco industry is in the possession of valuable data of their customers, such as location, travel habits, or call patterns. By applying predictive customer care to this data and acting on its recommendations, telco companies can address customer problems before they materialize, thereby increasing customer satisfaction and reducing customer churn.

More data also requires higher security measures. User authentication in the telco industry is starting to shift away from password-based approaches towards more secure methods such as two factor authentication (2FA) and multi-factor authentication (MFA). 2FA comprises an additional second verification step (e.g. code via SMS), and multi-factor authentication uses biometric technologies to identify customers (e.g. face recognition and voice analysis). Besides enhancing user experience, such advances in smart user verification drive more secure and cost-efficient mobile payment methods.

Another technology which can affect the customer interaction possibilities for telco companies is Augmented Reality (AR). Large investments in application development as well as in special hardware for AR make the technology commonplace and allow companies to profit from this trend. The enhanced visualizations can enable customers to be guided to install and repair devices themselves without the need of waiting for a technician. Furthermore, it can be used to enhance the offline shopping experience.

The last trend addresses the rise of online personalization. It gives the telco industry a great opportunity to provide customers with a much more personal experience than ever before. Telco companies have access to enormous amounts of user data and could make use of it by, for example, providing customers with personal product or contract recommendations. These measures can potentially lead to an increased customer satisfaction and retention. Personalization will help to build a connection between online and offline worlds, to deliver a consistent cross-channel personal experience.

# SMART ASSISTANTS

## Improving Customer Experience by Leveraging NLP and AI Technologies

SAs describe a software program that performs tasks and answers questions through a text- or voice-based interface. This enables companies to automate their customer care, as SAs require less manual labor and can easily handle spikes in demand. Thereby, customers receive a detailed response to their requests at any time [1]. Today's SAs are either used as general-purpose assistants (e.g. Apple's Siri), or can be employed by businesses to handle customer interaction [2]. Most of the customer-facing chatbots today are still text-based and rely on guided conversations, where the user chooses from suggested options. Common chatbots include Conversational Commerce Bots, which replace the interface of online shops, and Content Bots, which deliver a custom-ized newsfeed [3]. More sophisticated SAs are using NLP and a list of predefined words to derive a basic understanding of the input [1]. Through Reinforcement Learning chatbots can improve their own performance by varying responses and observing the satisfaction of the user [4]. Most recently, Orange and Deutsche Telekom announced Djingo, a virtual personal assistant device that can be controlled by voice or text [5]. As the first telco companies are entering the market for such devices which was thus far dominated by Amazon's Echo and Apple's HomePod, this could signal a paradigm shift [6].

### Facts:

- Approximately 80% of businesses in Europe, Middle East and Africa expect to be using chatbots in 2020, while 36% already started using them to some extent [7]
- 50-65% of customers want digital customer care, but only 10-15% can currently use it for all their requests [8]
- A third of customer care and sales representatives could be replaced with current technology already [9]
- Number of Facebook chatbots tripled to 100k from Nov 2016 to April 2017 [10]

- Messaging apps have been growing faster in monthly active users than other apps and the top 4 players in the market now have more users than the top 4 social networking apps [11], [12]

### Key Drivers:

- Decreasing prices in hardware and increasing processing power as well as shifts in research towards NLP and ML [13]
- Chatbots are easier to develop than mobile apps and have less portability issues between platforms [14]
- Chatbots will deliver higher quality customer care in specific tasks, as they access up-to-date databases and do not suffer from mood swings or tiredness [15]
- Growing number of users and time spent on messaging apps together with abandonment of company-specific apps [16]
- Opening up of messaging platforms to chatbots (e.g. Facebook, Telegram, Slack) [17]

### Challenges:

- Understanding of NLP might be limited, especially with more slang terms and complex contexts, and thus frustrating the customer [4]
- Trade-off between protecting customer's data and giving data access to chatbots for performance [18]
- Possibly intimidates people, when chatbots approach human-likeness too closely – this phenomenon is also called Uncanny Valley [19]
- Self-learning bots are very dependent on datasets and need to be monitored closely, as they can develop unwanted behavior or be manipulated [20]

### Impact on Customer Interaction in the Telco Industry:

The establishment of SAs could revolutionize the way telco companies interact with customers in two ways: It enables the customer to choose the "terms" of each interaction, as he can choose his preferred channel and time of communication. SAs might reinforce the trend of customers not interacting directly with a sales representative when making purchases, thereby pushing human employees into supervisory roles [7]. By entering the market for SA devices, telco companies would create new opportunities to strengthen their importance in customers' lives by being their central communication point towards other services and companies.

# INTERNET OF THINGS

## More Connectivity in the Industry and Every Household

The basic idea of IoT is the connection of physical objects (e.g. lamps, refrigerators, cars) to the internet and therefore also to each other. Some of the most promising areas for IoT solutions include wearables, homes, retail environments, offices/worksites (e.g. mining, oil and gas), vehicles, cities and transportation (especially container shipping and package delivery) [21].

The roots of IoT go back to 1999, when a research group of the Massachusetts Institute of Technology was working on radio-frequency identification chips, which are used widely in the industry today for tracking in logistics [22]. Recently released SAs like Amazon Echo or Google Home have also made IoT in the private sector more accessible to the mass market. The sector itself is growing exponentially and will become one of the biggest markets of the future [23]. Especially the trend of smart devices and increasingly connected devices in every household will affect the telco industry.

### Facts:

- By 2020, the number of Internet-connected things will reach over 20bn [24]
- Already in 2008, there were more objects connected to the Internet than people [22]
- The global market for wearable devices has grown 223% in 2015 [25]
- 80% of retailers worldwide say that IoT will drastically change the way companies do business in the next three years [26]
- 10.2m units of smart clothing will be shipped in 2020, compared to 140k units in 2013 [27]

### Key Drivers:

- The development of low-cost sensors will enable the release of new IoT devices [28]
- The wide implementation of the new 5G standard will allow more internet connectivity for data intensive IoT devices [28]
- The decrease in costs per CPU memory and storage will make it much cheaper to collect, transfer and process IoT data, enabling new use cases [29]

### Challenges:

- IoT lacks consistent standards for devices, throughout the technology stack [22]
- Data security, especially for sensible data like health or car safety [30]
- The currently used internet protocol IPv4 is limited to 4.3bn unique [22]
- Developing energy self-sustaining sensors to avoid charging billions of devices [22]

### Impact on Customer Interaction in the Telco Industry:

Since IoT devices will increase the data usage of customers dramatically, they will be more sensitive towards the cost of data. However, the telco industry will still need to invest in the setup of the new 5G technology to provide a fast network. This can also be a distinguishing factor for customers to decide which provider to use. Additionally, there is a new opportunity to provide an all-in-one system for the private sector. Customers will have a high incentive to choose the telco provider, who offers a standardized solution to connect all their smart devices to one router.

# PREDICTIVE CUSTOMER CARE

## Anticipating and Reacting to Customers' Needs Before They Evolve

Predictive customer care allows organizations to anticipate the needs of the customers early on, in order to avoid customer complaints. This technology relies on a set of increasingly sophisticated statistical algorithms and ML techniques that reveal relationships and patterns within large amounts of data. To make effective predictions, it is important to gather raw, historical data [31]. Computational systems, such as neural networks, use this data to identify patterns or trends, which are too complex for humans to detect, leading to more accurate results [32].

Every customer interaction, as e.g. a purchase, a phone call, a store visit, or a bill payment, contains new insights into habits and persistent issues. The generated insights can then be used to predict future behavior and events that might cause dissatisfaction of customers. This allows organizations to anticipate customer problems and needs based on behavioral data and not assumptions, thereby focusing on offering solutions to customers, before problems arise [33].

### Facts:

- 43% of telco executives want predictive analytics to reduce the number of decisions made, based on incomplete/inaccurate data [34]
- Telco companies are performing well on sourcing and analyzing data, while only 30% excel on the capability to act on data [35]
- 71% of communication service providers that invested in analytics achieved a positive return the next year [35]
- Cox Communication, a US telco company, reduced customer churn by 28% through acting upon the recommendations of predictive analytics [36]

### Key Drivers:

- Computational and storage costs are decreasing and predictive techniques such as ML and deep learning are improving [37], [38]
- The world's data volume is constantly growing, a predicted 50-fold growth from 2010 to 2020 [39]
- More organizations are investing in big data and analytics [40]
- ML algorithms can now analyze customer calls to measure the rate of speech and physical stress in the voice [Vodafone representative, personal communication, August 30, 2017]

### Challenges:

- The available data often represents a biased sample that does not correctly represent the underlying truth, resulting in an inaccurate predictive model [41]
- To improve the value of information, legacy databases have to be seamlessly integrated with related data from different sources [42]
- The quality of the provided services can only be improved if irrelevant information is filtered out of the customer interaction data [31]
- Organizations need to respect privacy concerns and gain customer trust while at the same time obtaining private data about customers [43]

### Impact on Customer Interaction in the Telco Industry:

Predictive analytics delivers tailored information to call center agents to understand customers' experiences and proactively take measures to keep them satisfied, rather than react to problems [33]. Knowing the customers' call patterns, location, mood while on call with agents or travel habits help telco companies make informed decisions [Vodafone representative, personal communication, August 30, 2017]. Telco companies track this information which allows them to predict which customer has the potential to become a long-term client or might encounter a problem in the near future [33]. In addition, telco companies can analyze how bandwidth spikes impact customer experience to build smarter networks and maintain customer satisfaction ahead of the demand curve [44].

# SMART AUTHENTICATION AND PAYMENT METHODS

**Simplified Customers' Authentication and Online Payment by Using Biometric Verification and Blockchain**

With new services and applications evolving in the telco industry, the thereby generated amount of confidential data brings more security risks in the daily use of smartphones [45]. Yet, In the field of user authentication, telco providers still mostly use password-based approaches for customer authentication and payment, which have been in use since the early days of computing [46]. Such outdated approaches have drawbacks to data security and are considered inconvenient during customer interaction.

However, the telco industry is currently witnessing a shift in user authentication, away from password-based approaches, towards more secure methods such as 2FA and MFA. In 2FA, the user is required to provide a second verification step, e.g. a code via SMS, in addition to the password [45]; MFA requires an additional unique authentication to verify the user's identity based on biometric data, e.g. face recognition, voice analysis, or signal recognition [47]. Such advancements in smart user verification lay the foundation for more secure and convenient mobile payment methods, such as mobile wallets (e.g. Apple Pay). Other technologies, such as cryptographic currencies and blockchain, are paving the road for more convenient and cost-efficient payments in the telco industry [48].

## Facts:

- 40% of users forget one of their passwords once a month and 86% leave a website when asked to register [49]
- 77% of US chief information security officers had MFA as a top implementation priority in "identity and access management" in 2016 [50]

- Total transaction value in the mobile payments segment doubled to 224.4m USD in 2017 compared to 2016 [51]
- Globally, the number of near field communication enabled mobile phones has risen from 1.025bn in 2016 to 1.445bn devices in 2017 [52]
- The number of blockchain wallets has been growing since the creation of Bitcoin in 2009, featuring around 15m blockchain wallet users in 2017 [53]

## Key Drivers:

- Increasing developments in biometric verification, e.g. new methods based on the heartbeat electrocardiogram signal by NASA [54]
- Biometric verification is rapidly spreading to the commercial sectors, including enterprises, banks, healthcare, and its integration to secure the IoT [55]
- Today, 750m biometric smartphones are in use, amounting to 30% of all smartphones, accelerating user's adoption of biometrics technology [56]

## Challenges:

- Enhanced computational power via quantum computing threatens current cryptographic systems with a one-in-seven chance that it will break public-key-cryptography by 2026 [57]
- Customer acceptance and education about the usage of biometric data for biometric implementations in online payments [58]
- Implementing a legal landscape to regulate the collection and commercial use of biometric data, while adapting to the rapid developments in biometric technology [59]

### Impact on Customer Interaction in the Telco Industry:

The developments of biometric technologies will improve two secondary, yet essential, parts of customer interaction with telco companies: namely, verifying the identity of the customer and paying online. Biometric authentication offers a higher level of security compared to password-based methods. Additionally, it is more convenient for customers, as it saves the time and effort of answering authentication questions in each call and logging in with a password online. Besides the convenience and security of using biometric technologies in online payments, blockchain offers customers a more cost-efficient payment method by bypassing third parties and their fees.
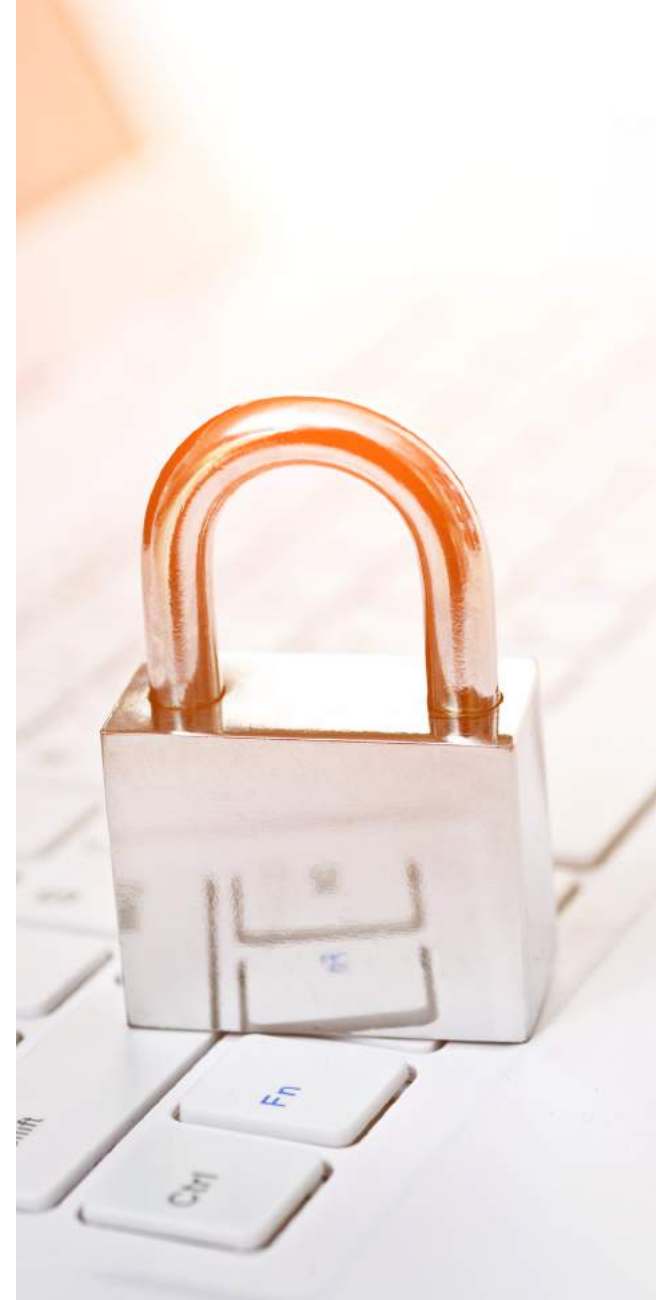
# AUGMENTED REALITY

## Enhancing In-Shop Experiences and Technical Support with Augmented Reality

AR is a technology which enhances the physical world with digitally provided additional information in real time. While the user's environment is only visually augmented, the underlying data is not only based on a camera, but also relies on other sensors, such as GPS, Bluetooth, or connected devices [60]. After AR attracted remarkable attention in the gaming industry (e.g. Pokémon Go), it is now spreading into many other fields, such as production and maintenance [60], [61].

Improvements in computer vision algorithms, software development kits (SDK), and hardware development have decreased costs and made the technology more reliable. In addition, the growing number of special AR devices that are worn, such as glasses (e.g. Sony SmartEyeglass, Microsoft Hololens, Google Glass), provide easy access to the usage of AR without previous technical experience [62]. The fact, that these devices are easy to wear and leave the user hands-free increases their attractiveness for users.

### Facts:

- The number of monthly active AR users is expected to grow from 350m in 2014 to 1.9bn in 2019 [63]
- Whereas 89% of US citizens have never used AR or do not know how to use the technology, 77% are interested in using it [64]
- The revenue of the AR market is expected to rise from 2.1bn USD in 2016 to 18.6bn USD in 2021 [65]
- The worldwide sales for AR devices are expected to grow from 0.1m in 2016 to 450m in 2021 [65]

### Key Drivers:

- Extension of technical possibilities and reliability by improved computer vision algorithms and AR technologies, such as Google Tango [61]
- Increasing usage and complexity of hardware in the telco industry [60]
- Growing interest in AR supported manuals and customer care [64]
- New technologies, such as 5G, provide higher speed and volume of the broadband network, which enables more complex AR applications [66]

### Challenges:

- Currently there are problems with user experience, as users get motion sick or encounter technical glitches [67]
- The price for hardware as well as for the development of AR software remains high [62], [68]
- Many recent developments focus on the industrial market and not on the consumer [67]

### Impact on Customer Interaction in the Telco Industry:

AR can have a large impact on the customer interaction of telco companies. To improve customer support, telco companies can use AR guidance for tasks, such as the initialization and maintenance of hard- and software. This offers advantages for customers as well as for companies, which do not have to send costly experts to every customer or try and solve the issues with multiple telephone calls [61]. Aside from the enrichment of support tasks, AR can enhance the offline shopping experience by providing visually appealing and personalized information.

# ONLINE PERSONALIZATION

**Transition to Personalized Online Customer Experiences, Enabled by Behavioral Tracking**

Increasing availability of user tracking data and advances in data analytics, enable new ways of customer interaction, such as personalized experiences. Personalization includes product and content recommendations, targeted advertisements and communication [69]. Employing personalization can lead to higher conversion rates, customer satisfaction, and retention.

Tracking data may include a user identifier, demographic profile, social activities, preferences, historical interactions, and contextual information. All of these can be combined and interpreted to get deeper insights [70].

The telco industry collects valuable data about users' activities [71], habits, and preferences and has a unique magnitude and ease of access to dynamic and contextual information about users. However, telco companies still only sell phones, contracts, and non-personalized services in offline retail stores, not leveraging the mentioned opportunities to their full extent and not painting a consistent picture of a user across digital and offline channels [72].

## Facts:

- 83% of customers conduct research on offers online before entering the store, making digital touchpoints a strong potential influencer [72]
- 50% of telco customers are willing to pay more for a valuable experience and 80% of customers are interested in proposals for additional telco products and services [72]

- Online revenues are expected to keep increasing now being at 10% [Vodafone representative, personal communication, August 30, 2017]
- Over 60% of people on social media look at online customer ratings and customer [8]
- Customers want personalized offers and an experience that is consistent across channels [72]
- For users, the opportunities which technology enables, outweigh potential privacy risks [70]

## Key Drivers:

- Increasing computational power and decreasing hardware prices make large scale personalization affordable [73]
- Developments in data analytics and recommendation algorithms make online personalization more effective [73]
- Scalable out-of-the-box cloud solutions, for data processing and storage, heavily reduce development and integration cost [74]
- Exponential increase in available user tracking data [75]
- The ubiquity of personalization makes it a new digital norm [76]

## Challenges:

- Adhering to privacy laws is an obstacle to fully utilizing data
- Customers lack information about tracking and usage of data and therefore feel threatened and act overly careful
- Being fully transparent without confirming fears is difficult
- Developing algorithms to infer valuable user insights is challenging and problem specific

## Impact on Customer Interaction in the Telco Industry:

Personalization in the telco industry is a huge opportunity to reach customers much more directly, for example, by providing personal recommendations for contracts, services, or devices on the website. Providing the right content to the right person at the right time can potentially help to increase conversion rates, customer satisfaction, retention, and revenues. Having a consistent user profile allows to build a connection between online and offline worlds and to deliver a consistent cross-channel personal experience.
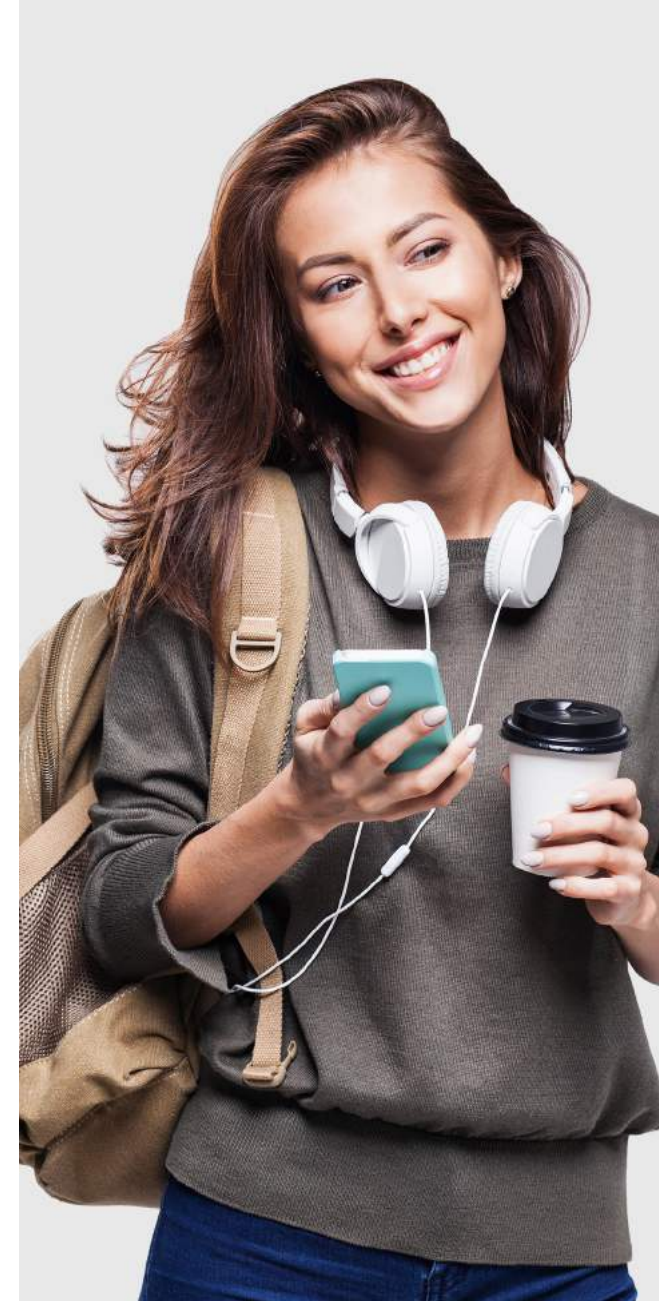
# SOCIETAL & ENVIRONMENTAL TRENDS

## SHAPING THE FUTURE OF CUSTOMER INTERACTION IN THE TELCO INDUSTRY

Demographic Change

Ethical Boundaries of Technology

Privacy Paradox

Consumer Empowerment

Culture of Instant Gratification

Generation of Sharing and Experience

# SOCIETAL & ENVIRONMENTAL TRENDS

### Shaping the Future of Customer Interaction in the Telco Industry

Society is a reflection of the interactions that shape human relations. Its culture, institutions, organizations, people, and products that are in constant change through novelties brought by time. New practices and mindsets both influence the structure of civilization and arise from shifts within it. Technology and knowledge, as realizations of an expanding human progress, are core agents of change in this dynamic system. As changes come into play, one can only wonder how these forces will transform the way humans behave, desire, and achieve satisfaction. Understanding these trends is a challenge for any company that wishes to interact with its customers in a valuable long-term manner.

After thoroughly considering current influences that are set to shape our society and environment, we identified seven trends with implications on the future of customer interaction in the telco industry. First, the demographic structure of the world is changing: our population is becoming older and more diverse due to low fertility rates, advances in healthcare, and an increasing number of migrants. Central reasons for this development are urbanization, changes in lifestyle, and the challenge of reconciling parenthood and career.

Second, hyperconnectivity describes the continuous and expanding state of connection between people. This is mainly enhanced by advances in technology and emerging social networks, which give consumers the possibility to decide how often and when to be online. Hence, providing the means for maintaining a constant online presence will be one of the main challenges for telco companies.

Third, people are concerned about the implications of emerging technologies on human identity and living together in a society. As they target core areas of human activity, people increasingly question the ethical boundaries of technology. Finding a balance between stimulating innovation and protecting core values and rights will be an ongoing challenge in the digital era.

Fourth, consumers are concerned about privacy. The capture and usage of data, however, becomes increasingly important for businesses to succeed in a digital environment. Despite being concerned about data protection, people tend to share personal information in return for tangible benefits and rewards. This is termed the privacy paradox.

Fifth, consumers are experiencing new positions of power in the market. Digital technologies help them obtain information, exchange opinions, and influence businesses at a growing pace. Consumers are starting to leverage this power to demand and shape services that satisfy their needs.

Sixth, as time and distance become less restrictive, a culture of instant gratification is on the rise. This culture is characterized by demanding instantaneous need-fulfillment and less patience. It is driven by the mindset of digital natives and an increasing availability of on-demand services. Regarding the rapid development of technology, these demands are likely to manifest themselves even more strongly in the future.

Finally, generational changes have led consumers to lose their interest in solely materialistic possessions. Instead, experience, community, and sustainability lie in this generation's focus. Thus, disruptive new consumption patterns of sharing and experience economies emerge. These foster consumers' increasing demand for personalized and exciting experiences, which can be shared with one another.

# DEMOGRAPHIC CHANGE

## Shifts in Population Structure as a Result of Changing Living Conditions

The European population is becoming older and more diverse. Low fertility rates and an increasing number of migrants from different regions of the world eventuate in a far-reaching shift in demographics. Society is influenced by demographic change in various ways: Issues such as pensions, healthcare, education, and varying labor force structures pressure the government, public institutions, and companies alike. Population decline, as a result of a birth deficit, is not only an issue in Europe [77].

The reason for declining birth rates is a change in the role of women in society: with equal access to education and rising qualifications, women now face the challenge of simultaneously pursuing careers and having children. Only in societies, which allow families with two working parents to reconcile job and family, birth rates have maintained the same level as before the 1960s, when access to education started to become equal for both males and females [78]. In emerging economies, the speed of population aging is rising rapidly [79]. On a global perspective, population growth will occur slower, people will become older, and will progressively live in urban environments [80].

### Facts:

- 20% of the world and 30% of the Western world will consist of people older than 60 by 2050 [81]
- World population will grow from 2.5bn in 1950 to a forecasted 9.2bn in 2050 [82]
- 15% of the world's population lived in Europe in 1990, whereas only 7% of the world's population will live in Europe by 2050 [83]
- In Europe, life expectancy for men is 78 years and 83 years for women in 2016 and will be 84 years for men and 89 years for women in 2050 [84]
- As a result of migration, 244m people worldwide (3,3%) lived outside their birth countries in 2016 [85]

- In North America, Latin America, the Caribbean and Europe, more than 70% of the population lived in cities in 2015 [82]

### Key Drivers:

- Equal access to education for women and the introduction of oral contraceptives led to a decline of birth rates [78]
- Improvements in healthcare and medical support in the 20th century resulted in fewer deaths among newborns and increased longevity [86], [87]
- The majority of people in Europe are becoming increasingly aware of the importance of balanced nutrition, exercise, and healthy habits for personal activity [88]
- Worldwide migration strongly changes population structures [85]

### Challenges:

- Possible visual and auditory impairments, especially for people older than 70 [81]
- Decrease in physical performance and capability with effects on sports, work, and everyday life in general [81]
- Varying anthropometric parameters, reaction times, and behavior among the elderly make product development increasingly challenging [81]
- Dual challenge of simultaneous population aging and population decline [89]

### Impact on Customer Interaction in the Telco Industry:

On a macro level, demographic change influences the way customers interact with their telco providers significantly. One central component is that older people show a stronger interest in privacy than their younger counterparts. In our society of knowledge, customers are aware of the possibilities telco providers have in dealing with customers' data. Communicating that privacy standards are adhered to will be a central component. Furthermore, the interaction with aging customers has to be adapted to slowed learning speeds [81]. For telco providers that means decelerating within customer interaction. Human capacity at age is highly variable since it underlies various factors [90]. Taking into consideration vast inter-individual differences of customers will become an important aspect of effective interaction.

# HYPERCON-NECTIVITY

## Permanent Connection through Digital Integration of Systems and Devices

The invention of the telephone in 1876 and its popularization in the decades afterwards built the fundament for a connected society. Enabled by developments in big data technology, smartphone popularity, and internet access, we now have the possibility to be constantly available to our contacts through various channels such as email, messenger services, and social media apps [91]. Nowadays, ubiquitous computing encompasses every aspect of our lives and is initiating a paradigm shift towards a hyperconnected world [92].

As more devices are connected to the internet, big data is generated and processed into useful actions. This increases efficiency for many industries, such as retail and healthcare [91], [93]. While hyperconnectivity undoubtedly facilitates our lives, experts argue that the state of always being online profoundly affects human behavior and has an impact on societal relationships [92].

Focusing on the downside, studies examine whether this trend leads to detrimental effects on physical and mental health e.g. addictions and burnout [94]. Hence, balancing connectivity and time spent offline, often referred to as "digital detox", is a challenge the majority of G20 countries is struggling with. On the other hand, almost two thirds of the global population are still offline [92].

### Facts:

- 2.5bn consumers are expected to be connected through 75bn devices in social networks by 2020 [95]
- People spend three hours per day using their smartphones with the vast majority of time spent on social networking sites or WhatsApp which is the main way to contact with peers [88]

- The percentage of adults, who are online, using social networking sites has risen from 8% in 2005 to 72% in 2017 [96]
- 5% of worldwide study participants would give up alcohol, 27% sexual intercourse, and 22% showers for a year, if the refusal to do so would lead to no internet access [97]

### Key Drivers:

- Wider availability of internet access due to the expansion of broadband and mobile internet [98]
- Exponential growth of mobile and wearable computing devices [99]
- Emerging dominance of social and consumer generated media in daily life [100]
- Use of cloud services for data and applications [99]

### Challenges:

- 33% of the German working population feel highly stressed by being available constantly [92]
- Permanent connectivity activates the brain's stress system and increases the risk of diseases, such as burnout or depression [101]
- Websites and online forums are increasingly used by terrorist and extremist groups [102]
- 55% of adults say they worry about privacy due to connectivity [92]
- Although 40% of companies have a Bring-Your-Own-Device policy, 79% of those have not trained employees about the risks of it [103]

### Impact on Customer Interaction in the Telco Industry:

As technological innovation makes ubiquitous connectivity more realistic, humans will have to decide when, how, and how much to be connected to others. Therefore, telco companies should pay attention to individual levels of connectivity and tailor their products correspondingly [103]. Two crucial dimensions should be taken into account: "communication effectiveness", as the ability to get the right information [103] and "communication efficiency", which represents the capability to obtain information with little effort. As an outlook, it is essential for the industry to foster data exchange all along the value chain to satisfy customers.
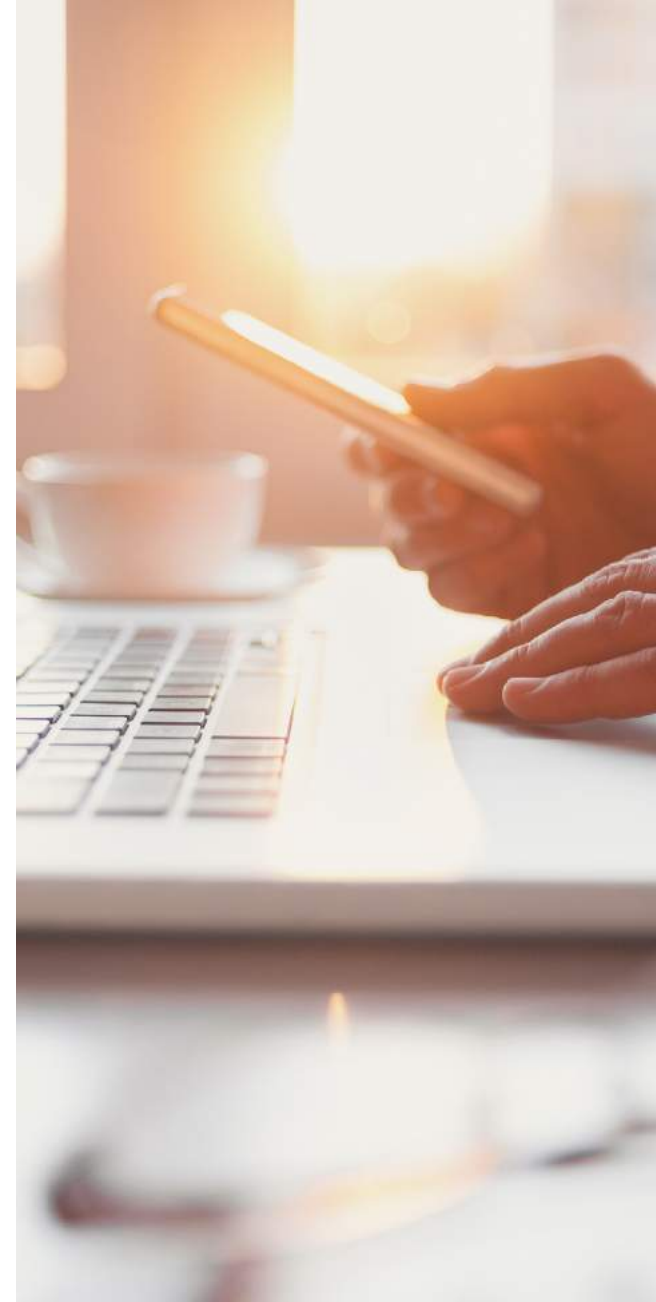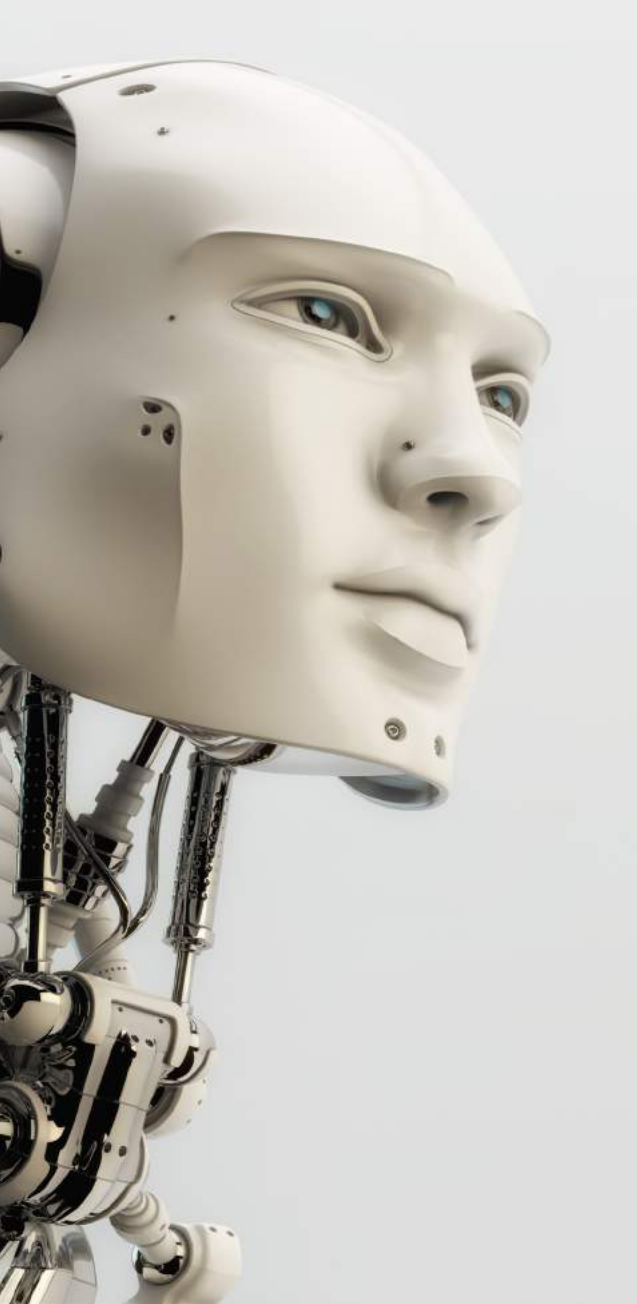
# ETHICAL BOUNDARIES OF TECHNOLOGY

**Rising Concerns about the Future of Technology and its Implications on Society**

Technological innovation is defining human advancement. The integration of emerging technologies in core areas of human activity raises questions about human identity and living together as a society in the digital era [104]. People often feel anxious about massive technological shifts, especially the ones they have no control over [105]. The fear of losing civil liberties due to corporate and government tracking as well as cyber terrorism are among the five biggest fears of US-citizens [106]. Data ethics, a new area of research and discussion concerning the moral problems related to data, is the most visible branch of technoethics as privacy concerns already affect the life of consumers as of now [107]. Technological innovations such as robotics and Artificial Intelligence (AI) increasingly target core areas of human activity by, for example, mimicking and replacing human tasks [104].

Finding the balance between stimulating technological development and defining ethical boundaries will therefore be an ongoing challenge for governments, companies, and consumers alike [77].

### Facts:

- 50% of business ethics violations are expected to occur through improper use of big data analytics in 2018 [110]
- Three out of the top five fears of US-Americans are related to technology [106]
- Tablets reached an adoption rate of 10% in the US in less than five years, compared to 25 years for telephones [111]

- Exponential growth of technology leads to radical changes in our society within years, compared to what once took centuries [109]
- People tend to feel aversion against humanlike robots and technology, which is known as the "uncanny valley effect" [112]

### Key Drivers:

- Acceleration of technology adoption [111], [113]
- Integration of technologies in core human areas and activities, e.g. health and bioengineering [104]
- Consumers lack understanding of technologies [114]
- Resignification of established concepts in society such as employment and taxation [115]
- Regulatory gaps since laws and policy makers cannot keep up with technological developments [109]
- Fear of technological shifts [105]

### Challenges:

- Need for ethical boundaries due to a lack of sufficient regulation in order to gain and maintain trust of customers [116] - [118]
- Employees and customers fear of technology e.g. losing jobs to automatization [119]
- Enabling technological innovations while protecting core values and rights of consumers [108]
- Continuously adapting existing ethical and regulatory frameworks in a fast-paced digital era [109]

### Impact on Customer Interaction in the Telco Industry:

Companies need to set clear ethical boundaries, in line with customer expectations about the use of technology, even when there is no regulation in place, to gain and maintain brand trust [118]. Mitigating fears of customers and employees regarding technological innovation will become a crucial business challenge. Especially when interacting with customers, companies need to find ways to introduce technology, such as chat bots without scaring or disappointing the user [120]. Employing humans for important customer-facing tasks may become a key differentiator in fostering customer experience [121]. In general, companies need to adopt technologies selectively, within clear boundaries, to create long-term business and customer value.

# PRIVACY PARADOX

## Consumers Tend to Share Personal Data for Benefits Despite Privacy Concerns

Data is the fuel of the technological age. The capture and usage of it is already an integral part of the business model of successful technology firms and will gain even more importance in traditional industries within the next decade [122], [123]. Consumers are increasingly concerned about sharing their personal information, but are simultaneously willing to yield their data for reasons of ease, speed, and convenience [123], [124]. The divergence of concerns and behavior when it comes to sharing personal information has become known as the privacy paradox [125]. Despite policy makers trying to close this gap by e.g. simplifying privacy disclosures, research suggests that it has little to no effect on the willingness of consumers to share data [126].

Some experts argue that we are now at a crossroad in privacy protection, as individuals seem to be increasingly concerned about privacy, but at the same time consumers share data in exchange for tangible benefits and brand trust [123], [127]. Hence, data collection and consumer tracking will increase in a brand-led data economy, as long as individuals value the rewards they are receiving for sharing personal information [128].

### Facts:

- The digital universe, a measure for data created and copied every year, is expected to reach 180 zettabytes by 2025 [129]
- Consumers neglect privacy concerns as soon as benefits are in sight: a service requesting more personal information is preferred if it is cheaper [130]
- People do not hesitate to share their name, home address, and mobile phone number on social networking sites [131]
- People indirectly pay with their personal data for service access, pleasure and being connected to others [131]

### Key Drivers:

- Personalization and mass customization require access to consumer data, granted by consumers for reasons of convenience [132]
- Low transparency and uncertainty of how data is used [133]
- Pervasive technologies and social media blur the line between public and private spheres [134]
- Surveillance against terrorism threat, surveillance scandals, and disclosures lead to skepticism [135] - [137]
- Fear of cyber-bullying and cyber-crime [138]

### Challenges:

- Users abstain from using specific internet services because of fear regarding their data privacy [139]
- Consumers expect corporations to secure personal data appropriately [140]
- Demand for a trustworthiness seal for products and services in the internet [141]

### Impact on Customer Interaction in the Telco Industry:

As customers show an increased interest and growing concerns about privacy, telco providers have to bear in mind that opportunities in dealing with customer's data are decreasing in their extent, as they become more restricted. Failure to comply with these developments may result in a vast decrease in the customer base. Privacy plays a central role in the interaction of customers and corporations. As a marketing, branding, and communication tool is a vital component of companies being perceived as transparent [142]. Close attention must be paid to the end of the supply chain, especially sales, which is highly data driven and acts as the connecting part between customer and company. Privacy regulation, if not adhered to, is particularly visible to the customer at this stage.

# CONSUMER EMPOWERMENT

**Digital Technologies Enhance Consumers' Abilities to Access Information, Co-Create and give Feedback**

Digital technologies have changed the way consumers interact with firms and with each other. Consumer empowerment is a positive subjective state that enables consumers to enforce their own choices by exposing and exchanging their demands with businesses and among themselves [143].

The internet enables the formation of a global marketplace with similar access to information about products, prices, and distribution, as well as reduced transaction costs [144]. Customers now have better access to peers' experiences and opinions and may directly influence purchase intent through electronic word of mouth [145]. Direct communication channels with brands, new product development techniques, and crowdfunding platforms promote opportunities for co-creation [146]. Consumers may define and select product features, delivery channels, exposure to advertising, and even prices.

These changes reflect increasing levels of consumer control and raise their perception of empowerment [147].

## Facts:

- Consumer control of choices is central to the experience of empowerment [147]
- Online marketplaces offer users a broad variety of products and choices in a phenomenon known as the "long tail" [148]
- 92% of online users in the US read online product reviews and 89% of these said it influenced their product choice in 2010 [149]

- Social commerce is an interesting trend for 59% and a game-changer for 16% of e-commerce specialists in Germany [150]
- Online firestorms damage brands through a sudden and viral discharge of online messages containing negative and aggressive word of mouth [151]

## Key Drivers

- Transformation from "information scarcity" to "information democracy" through the internet [152]
- Expansion of internet access and hyperconnectivity [see Social & Envoriomental Trends: Hyperconnectivity]
- Growth of e-commerce and online market platforms [153]
- Digital natives' demand of specialized products and services [155]

## Challenges:

- Market concentration narrows available choices and reduces customer control
- Network effects are able to manipulate social media users and undermine individual empowerment on the one hand, a highly beneficial environment for word-of-mouth [151]
- Expansion of options may become overwhelming and erode consumer satisfaction and sense of power, which is known as the paradox of choice [156]

## Impact on Customer Interaction in the Telco Industry:

Consumer empowerment mainly results in an increase in quality expectation and reactiveness. Products, services, and corporate images that fail to fulfill customers' expectations face rejection and outcry [144]. Telco providers need to tune and re-evaluate internal processes and marketing mechanisms to consumer-centric strategies [157]. Firms must vest employees with structure and resources necessary to respond to personalized demands. Consumer-driven production processes reallocate the product-push towards a consumption-pull strategy to meet consumers' needs [156]. Corporate social responsibility and other compliance mechanisms will increasingly influence brand image and stakeholder satisfaction [158]. Failing to adapt will favor heightened competition and long-standing relationships to fall apart [144].

# CULTURE OF INSTANT GRATIFICATION

## Demand for Immediate Customer Satisfaction Calls for Instantaneous Services

We are moving towards living in a world of real-time need fulfillment. Time and distance limitations are fading, action and response are becoming simultaneous. Customers demand instant gratification of their needs [159].

We instantly transfer vast sums of money, order fresh groceries, rent cars or bikes online, and are upset if someone takes too long to answer a text message. Instantaneous gratification seems to have become a hygiene factor of our one-click mentality and may lead to frustration when unfulfilled [160]. This relates to decreasing perceived time capacities of our generation. People experience time scarcity due to increasing working hours and the pressure of constantly being connected [161]. Therefore, our generation strives for efficiency. This means that customers of the 21st Century expect support services to react, online shops to deliver, and products to be available instantaneously.

Due to increasingly more accessible and faster technology, it is foreseeable that our culture's patience further erodes and expectancy for instantaneous gratification will continue to rise [162].

### Facts:

- Only 26% of internet-users are willing to wait more than five seconds for a website to be fully displayed [163]
- 66% of customers expect a product to be delivered within two days [164]
- 58% feel annoyed by long waiting times and 90% are not willing to wait longer than ten minutes for customer support [165]

- Younger shoppers use express deliveries and have a positive attitude towards new shipping methods e.g. drone delivery [166]

### Key Drivers:

- Enhanced connectivity due to internet-based technologies [167]
- Digital natives' mindset of immediate (online) need fulfillment [155]
- Availability and request for on-demand products and services [168]
- Perceived time scarcity due to constantly being connected and available [169]

### Challenges:

- Faster production cycles required to fulfill needs [170]
- Implications of faster production cycles on the environment [171]
- Contradicting customer needs for instantaneous gratification and being environmentally sustainable [172]
- Integration of new technologies and service delivery methods [173]

### Impact on Customer Interaction in the Telco Industry:

Telco providers should be aware of the increasing demand for instantaneous delivery of services. Not fulfilling users' inherent needs affects the reputation and competitiveness of corporations, as well as customer loyalty. This is especially important as immediate response is nowadays seen as a hygiene factor, which causes dissatisfaction when missing or inadequate [174]. Therefore, fulfillment or failure to fulfill instant gratification expectations is a factor influencing customer churn rates. As customers are not willing to wait and quickly feel annoyed by waiting times, providers have to consider new methods for service delivery and customer support in order to accelerate the process [165]. By considering further developments in technology and increasing internet access, telco providers should increase the immediacy of services by incorporating the latest technological advances. Finally, adapting to their customer's schedules and daily routines is of crucial importance for the perceived immediacy of need fulfillment.

# GENERATION OF SHARING AND EXPERIENCE

**The Needs of Generation Y and Z lead to the Development of Sharing and Experience Economies**

Generation Y is a generation of travelers, connoisseurs, and environmentally aware intellectuals with a decreasing interest in materialistic artifacts. Instead of expensive cars as status symbols, experience, purpose, and community are in this generation's focus [175], [176]. Thus, new consumption patterns and business models of sharing and experience economies emerge. Collaborative consumption is made possible by social networks and fueled by environmental necessity and customers' increasing cost consciousness. It occurs when people participate in sharing, renting, and swapping to get the same pleasures of ownership with reduced personal cost and burden, and lower environmental impact [177], [178]. It is likely to further reduce materialism due to the new generation's mindset and use of numerous bike and car sharing services. Shopping is not just purchasing, but an experiene [179]. This starts with innovative marketing initiatives such as storyscaping, including flagship stores or movies with the customer at the center [180]. While traveling, enjoying, and finding self-fulfillment, Generation Y will increasingly demand personalized experiences, to be shared with others.

## Facts:

- Most desired sharing offers include: lifts, tools, cars, bikes, apartments, clothing, and funding [181]
- More than 200m guests stayed in private homes in more than 190 countries and 65k cities by 2017 [182]
- In 2017 global ridesharing revenues reached 29bn EUR [182]
- Delivering experiences leads to vast increases in value for the customer and thus higher willingness to pay [183]

## Key Drivers:

- Growing connectivity enables sharing economies [184]
- Online payment systems gain in convenience due to technological advancements [176]
- Access over ownership for reasons of convenience [185]
- Customer-centricity due to consumer empowerment [157]
- Urbanization supports the emergence of sharing economies [186]
- Awareness of social and environmental sustainability [186]
- Monetization of excess and idle inventory [176]

## Challenges:

- Industry's planned obsolescence contradicts longevity of product life cycles for sharing purposes [187]
- Questions regarding taxes and insurance remain unclear [188]
- Issues protecting the customer from liability and fraud arise [188]
- Data protection concerns emerge due to increased sharing of personal information [189]
- Risks for established business models and thus current employment increase [190]
- Willingness to pay decreases due to cost savings from collaborative consumption [191]

## Impact on Customer Interaction in the Telco Industry:

Generation Y strives for experientialism and collaboration to enjoy and follow their hedonistic mindset. With an aim of reaching purpose, sustainability, and cost-savings, they appreciate the new emerging economies. This implies that telco providers will have to shift their focus from providing commodities to creating personalized and sharable experiences in order to differentiate themselves from competitors. Furthermore, delivering enjoyment with memorable experiences, as well as enabling cost-savings and contributions to the environment through sharing, leads to stronger relationships with customers. This aspect is also especially relevant to consider regarding marketing initiatives, as they influence consumer attitudes and the public reputation of telco providers [180]. In conclusion, providing customers with sharable experiences as products will help telco providers to differentiate from competitors, build long-lasting customer relationships, and gain a positive reputation in the future.

# LEGAL & POLITICAL TRENDS

## SHAPING THE FUTURE OF CUSTOMER INTERACTION IN THE TELCO INDUSTRY

Digital Public Investment

Towards a Single Digital Market

Data Protection by Default

Establishing a Digital Identity

Data Access for Governments

Net Neutrality in Danger

# LEGAL & POLITICAL TRENDS

**Shaping the Future of Customer Interaction in the Telco Industry**

The telco industry is linked uniquely with the surrounding political and legal system. An open market is a novelty in many countries; Germany liberalized the sector barely eighteen years ago. As the digital revolution creates new ways to do business and connect consumers with providers, regulatory forces struggle to keep up with the accelerated rate of change. Businesses looking to future-proof their foothold in the market should be aware of the existing trends in the political and legal spheres. For this purpose, we have identified seven distinct trends that will shape the industry in the next five years.

As the internet penetrates and ingrains itself into people's lives, it is increasingly being perceived as a basic right, on par with access to water and electricity. Growing advantages conferred by connectivity galvanize governments and other agencies to extend this bridge to as many people as possible. In the same vein, state agents are increasingly willing to invest in their digital infrastructure. These efforts are mostly centered around providing quality service, be it landline or mobile, to the largest area possible. In this way, they hope to enable economies to reap the rewards of a digitalized marketplace.

As many of these states' interests align, the need for standardization naturally arises. The European Union (EU) identified the benefits of a Single Digital Market early on and has declared it one of its flagship policies [192]. Opening trade borders creates both challenges and opportunities for all the actors involved.

One of these challenges is the concept of data privacy for the user. A high-profile topic in the last few years, it has quickly become a matter of consumer protection. States have begun to feel the pressure to closely regulate the balance between the protection of citizens' personal information and companies seeking to monetize its use. States must also learn how to balance this right with their obligation to protect the public's interest. The state security apparatus' data thirst has been much maligned, but there also exists an obligation to monitor and control channels through which crime and terrorism spread, if left unhindered.

Governments seek not only to monitor the web but also to become digital itself. A secure system for digital identification together with e-government could form the basis for more secure and trustworthy networks. These improvements are sure to open new possibilities for people to trade and consume goods and services. Finally, the hitherto existing models of handling data traffic are being challenged. The principle of net neutrality faces the prospect of data with different degrees of urgency for emerging services such as connected cars. Whatever the outcome of the courts, providers must adjust their offers to reflect the reigning standard.

In the coming pages, we will expand on these seven trends, exploring facts, key drivers, challenges and the overall impact they will have in the telco industry.

# INTERNET ACCESS AS A BASIC RIGHT

## Global Interconnection to Accelerate Human Progress

The internet provides huge social and economic benefits and is the key enabler of the Fourth Industrial Revolution [193]. The spread of information and communication technology accelerates human progress with the potential to bridge the digital divide. The global interconnection empowers people to educate themselves and enables them to solve their own problems. Therefore, it is unbearable that over four billion people remain unconnected to the world wide web [194]. Governments, companies, and organizations are working to accelerate internet access. Especially big technology companies, such as Facebook, Twitter, and Wikipedia, are eager to connect the world through new technologies [195], [196]. For telco providers, the necessity of internet access provides opportunities as well as challenges regarding infrastructure, business model improvements and a shift in the customer base [193].

### Facts:

- In 2016, less than 50% of the world population had access to the internet [197]
- From 2009 to 2016, internet adoption rate grew over 10% year over year [198]
- In 2015, the United Nations defined the goal to significantly increase access to information and communication technology [194]
- In 2013, the German Federal Supreme Court ("Bundesgerichtshof") decided that internet access is a basic right, enabling citizens to sue if they are unconnected over a certain period of time [199]
- In the Wi-Fi4EU initiative the European Commission determined to offer free public Wi-Fi in 8k communities across the EU by 2020 [200]

### Key Drivers:

- Agreements between technology companies and mobile phone providers allow people to browse at zero-rating conditions in developing countries [196], [201]
- New technologies like stratospheric solar planes and balloons making delivering data less expensive and easier [193], [202]
- Deregulation on a national as well as international level, e.g. abolishment of the infringement liability ("Störerhaftung") to support the public connectivity development [203], [204]
- Increasing number of smartphones worldwide due to lower prices in emerging markets foster a demand for affordable data plans [198]

### Challenges:

- The global cost of delivering data is 100 times too expensive for providing basic internet services free of charge to be economically feasible yet [202]
- Global infrastructure required to deliver internet is extremely expensive [193]
- Rural areas are characterized by high operating costs and low revenues per user, making infrastructure improvements unattractive [193]
- Wide public coverage challenges current commercial offerings [204]
- Lobbyists representing the telco industry will counteract state-run Wi-Fi coverage [205]

### Impact on Customer Interaction in the Telco Industry:

After disrupting SMS and going after telephony, the big technology companies are tackling internet access. Besides the technological improvements, they are experts in building services tailored to the needs of digital natives. Even if their innovations seem speculative, they have considerable prospects of being a competitor in the long term [193], [202]. Telco providers are also threatened by government institutions looking to offer free public Wi-Fi, despite the companies' current position in the market. Hence in terms of customer interaction teleco providers must deal increasingly with public institutions instead of the end user [206]. Lastly, the imperative of internet access puts pressure on the public sector for deregulation and tax reliefs to improve connectivity [193].

# DIGITAL PUBLIC INVESTMENT

## State Actors are Increasingly Willing to Invest in Digital Infrastructure

State actors are quickly becoming aware of the benefits to be reaped by developing their digital infrastructure. With rapidly changing demands, even established economies must keep up with an infrastructure necessary to sustain this growth. In the EU, multiple campaigns have been launched, both at a European and national level. Germany itself is just finishing to implement its Digital Agenda and looking forward to its comprehensive Digital Strategy 2025, which includes the promise of Gigabit-capable networks spanning the whole country [207], [208]. The new program will predominantly be financed by the re-auction of the UMTS spectrum, as old leases expire in 2020, resulting in a 10bn EUR investment.

Germany looks well on its way towards ramping up the investment in its digital future; it remains to be seen how large an obstacle the Federal Republic's penchant for austerity will prove to be [209]. On the international scene, the US continues to see the Federal Communications Commission's National Broadband Plan as its guiding document, relying heavily on the private sector to provide coverage and speed. Despite this, rural communities mostly depend on US federal grants to close the gap to urban centers [4], [5], [212].

### Facts:

- The European Parliament has recognized that an "inadequate digital infrastructure" has prevented firms and citizens from fully utilizing the Digital Single Market [213]
- Germany has one of the lowest rates of investment spending in infrastructure, ranks 19th in 4G coverage, and 21st in subscriptions to fast broadband (faster than 30Mbps) in the EU [209], [214]
- France, Italy, and the UK have all launched independent programs with similar goals to develop their digital infrastructure [215], [216]

- European Commission and the European Investment bank have announced a fund for broadband infrastructure, totalling 1.7bn EUR for broadband deployment [217]

### Key Driver:

- Continued increase in number of internet users worldwide [214]
- Steady growth of internet-based economy in both relative and absolute terms [218]
- Surge of global data rates place unprecedented strain on existing network links [219]
- Expansion in number of connected devices due to emerging services like IoT will saturate existing wireless infrastructure [220]

### Challenges:

- Strict adherence to the debt-brake ("Schuldenbremse") may starkly limit the amount spent by banning structural deficits in federal state finances [221]
- Euro area turbulence and prolonged weak growth may divert government spending into more urgent areas [222]
- Investment for LTE in Europe has been significantly smaller than the one for 3G networks, other technologies might fare similarly [214]
- Investment schemes must strike a balance between enough economic incentives for infrastructure providers and the necessity to cover all households

### Impact on Customer Interaction in the Telco Industry:

As money pours into the expansion of infrastructure, business opportunities will open, especially for providers that own infrastructure already and have the relevant know-how. Fiber build-up will become viable again in the short to the medium term as the last holes in connectivity are patched up across Germany [223]. Lawmakers and policy experts will look more positively upon public-private partnerships, seeking to diminish the impact of the investment on public finances [214]. With complete coverage, digital advertisements and business models will reach a significantly larger number of customers.

# TOWARDS A SINGLE DIGITAL MARKET

## Rising European Efforts to Empower the Domestic Digital Market

Since the foundation of the EU, it has always been a key goal to create one economic market. Member states of the EU agree on laws and set standards for future technologies. By applying the legal and technology standards across borders, the European market can be enforced. The development of the trade union made the European market the second biggest economic force in the world [224]. Today, each country has their own policy dealing with digital content regulations. The EU wants to unify and align the policies.

Over the last years, rising start-up companies challenged the traditional industries by offering digital products on top of the infrastructure. Companies like WhatsApp and Skype disrupt industries by offering a free service and get their value from collecting user data. Telco providers are strictly regulated on what they can do with customer data and raised the question why these services are not regulated similarly.

### Facts:

- Unified Digital Single Market within the EU has an expected business potential of up to 415bn EUR annually [225]
- EU's Horizon 2020 program offers a 700m EUR for research, development, and innovation on top of the 5G technology [227]
- Big price differences for data plans within the EU: On average customers in Portugal pay 30 EUR a month for 0.5 GB data volume, whereas customers in Poland receive an unlimited data volume for the same price [228]
- Abolishment of roaming costs for travelers within the EU in 2017 [226]

### Key Drivers:

- Application of the founding EU principle of a common economic policy to an emerging digital market [229]
- Legal adjustment of over-the-top (OTT) services (Skype, WhatsApp) to traditional telco services regulations [230]
- Further alignment of price differences for telco services within the EU, such as the abolishment of roaming charges

### Challenges:

- Industry resistance against abolishment of costs (e.g. roaming)
- Finding technology and legal standards for every member country to agree on
- Protection of a high standard for data protection and privacy standardization of international regulations within the EU and trading partners [231]

### Impact on Customer Interaction in the Telco Industry:

The creation of one digital and economic market in the EU requires far-reaching international standards in terms of data protection and privacy regulations. In order to comply with special regulations, telco companies often have to invest high amounts to develop the technical infrastructure needed (e.g. data retention) [232]. Standards in regulations within the EU will make it easier for companies to expand their business to other countries easily and save investments into complying with special national regulation. Due to the abolishment of roaming charges, European telco companies will lose 7bn EUR in revenue by 2020 [233]. While the lack of roaming charges saves money for the customers, telco providers still have to pay other providers, if the customer is using a different infrastructure. A continuing development in this direction can result in even higher revenue losses, forcing telco providers to increase prices.

# DATA PROTECTION BY DEFAULT

### The EU Unifies Regulation by Introducing the First Global Data Protection Law

Increasing globalization and the rising amount of data available to companies requires regulators to act and create a standard for data protection. The EU is enforcing the first global data protection law in 2018, the General Data Protection Regulation (GDPR), which will unify the way European and international corporations can collect and handle personal data of EU citizens [234]. For the first time in history, the EU is exporting a data protection regulation to the rest of the world, which will have a huge impact on international companies. The US does not currently have a single data protection authority and is rather regulating by industry sectors [235]. Therefore, especially for US based corporations, GDPR can be a struggle. Facebook, for example, is increasing its data protection team by 250% in Ireland this year to support the GDPR [236].

Besides the GDPR, more initiatives are probably coming to fruition: the EU is planning to update the ePrivacy directive and is furthermore in talks with Japan to recognize each other as having equal data protection laws after its regulation reform in May 2017 [237], [238]. These are first steps towards increasing and standardizing data protection laws and are likely to be followed by more.

## Facts:

- Removing regulatory walls between EU member states could add 415bn EUR annually to the economy [239]
- 62% of people in Germany have data protection concerns as of 2015 [240]
- It is estimated that by 2020 40 zettabytes (43tr gigabytes) of data will be created (300 times the amount of data in circulation in 2005) [219]

- The GDPR is enforcing non-compliance fines of up to 20m EUR or 4% of a company's annual turnover (whichever is greater) [234]

## Key Drivers:

- Increasing amount of available data, especially sensitive personal information [219]
- Rising awareness of data protection in the society, combined with a growing willingness to share private data [125], [240]
- Accelerated innovation cycles create an urge for new legislation as the fast technological developments can make current regulations obsolete [241]
- Increasing data exchange between companies and individuals across borders

## Challenges:

- Rising technological complexity complicates the formulation of new regulations [241]
- Lobbying power of large corporations increases the difficulty for regulators to define a common standard [242], [243]
- Cross-border barriers and differing national interests hinder the creation of an international legal framework
- Trade-off between data protection and arising possibilities of data usage by companies [244]

## Impact on Customer Interaction in the Telco Industry:

Telcos must keep pace with stricter privacy laws. Their ability to customize the consumer experience based on collected data will be hindered and potential new business models might not be legally feasible [245]. However, new customer touchpoints are created, as explicit opt-in consent is needed by the consumer [234]. In order to ensure secure data protection that is compliant with new regulations, telco companies will have to alter their IT landscape. Data protection can be employed as a competitive advantage in this new setting. At the same time, the lack of it can pose a risk, financially and also in terms of reputation [246]. British provider TalkTalk, for example, lost 101k customers after a security breach in 2015 [247].

# ESTABLISHING A DIGITAL IDENTITY

## Providing More Secure Solutions to Digitalize Governmental Services

Digital identity solutions are increasingly moving into the focus to lift the security and trust level within the digital landscape. The increasing amount of personal data stored online fosters the rising concerns about personal data usage. [248]. In general, multiple identification methods can be used to identify a person in the digital space and shifting from the classical approach (username & password) to more advanced solutions (e.g. biometric data). Especially governments increase their efforts to introduce e-government solutions to meet the people's needs [249]. A common standard with an enhanced security level is necessary to still be able to establish trust among the required parties (e.g. government and people) to exchange sensitive data. Consequently, new identification processes are currently evaluated and tested [see Technology Trend: Smart Authentication]. Introducing a digital identity requires a verified solution from a government, but so far there is no common standard. [250]. This development will be particularly relevant to offer new services online, such as elections, the order of passports, and health reports.

### Facts:

- The number of mobile devices with biometric authentication is growing from 190m devices in 2016 to over 600m devices in 2021 (Compound Annual Growth Rate (CAGR) 2016-21: 25.9%) [251]
- Trusted digital identity solutions will enable 50bn USD in global annual savings by 2020 [252]
- Identity fraud rose by 16% to over 16m customers in the US in 2016 [255]

- The number of breached records (e.g. user accounts) is constantly increasing from over 700m in 2015 to 1.3bn in 2016 [253], [254]

### Key Drivers:

- Increasing exchange of sensitive personal data over the internet fosters additional requirements (e.g. digital identity) to create trust [256]
- Increasing demand of inhabitants to conduct official duties over the internet (e-government) [204]
- Strengthened governmental support to provide digital end-to-end services to all citizens and businesses, such as the e-government Action plan [257]
- Enhanced efforts from the private sector to provide more secure identification solutions to customers

### Challenges:

- Establishing a high-secure solution and developing a common standard for identification to protect sensitive personal data
- Governmental organizations face difficulties to shift services from analogue to digital
- Constant arms race against cybercrime and security services to prevent data breaches
- Governmental institutions use the internet for public service offerings in an ineffective and unstructured way [249]

### Impact on Customer Interaction in the Telco Industry:

The recent digital identity governmental initiatives did not have the desired impact. In most countries, a standardized digital identification option is not yet established. Telco companies already have personal data from multiple sources and have the technical knowledge to support the development [248]. Leveraging this experience can put telco companies in the position to verify the identity of their customers for further online services [258]. By establishing a governmental certified solution, telco companies can use the new identification process for their online sales channel to secure the verification and payment.

# DATA ACCESS FOR GOVERNMENTS

## Stricter Regulations on Privacy Protection and Data Security

Digital traffic is constantly increasing, thus elevating the importance and relevancy of the data. Consequently, governments and federal police authorities are currently investigating potential solutions to gain access to this data, especially in case of a suspicion of a crime. Right now, most developed countries are dealing with issues in terms of how and when they are allowed to access data. Germany's response was the passage of the data retention law, but this was already rejected twice by the European Court of Justice since it does not align with the EU guidelines [259] [260]. Nevertheless, governments are heavily investing into special malware which is capable of capturing and tracking a suspect's computer (e.g. NSA's "regin" and German state Trojan)[261]. Using this malware, governments want to gain access to encrypted data, but currently, most of the highest justice courts are rejecting it. All these activities, especially the state-owned malware, happen without the society's knowledge most of the time.

This trend has a major impact on the consumer since it will define the usage and access of personal data for every individual in the country. In addition, it is highly connected to the increasing mass surveillance of the society by the state.

### Facts:

- The request for data from the German government rose by 48.0% (35.4% in the US) from 5k (37k) in 2015 to 8k (50k) requests [262]
- The German security authorities requested 10.3 m individual telco data in 2016 in comparison to 6.9 m in 2014 [226]
- The UK passed the Investigatory power act which includes that companies need to store bulk data about website traffic for more than a year [263]

- 68% of US, UK and German citizens said the government should not force private companies to hand over encrypted personal data without consumer consent [264]

### Key Drivers:

- Recent global increase in government demands for data held by the private sector [265]
- Increasing efforts from online service providers to further enhance their encryption technologies to protect customer personal data [266]
- Rise of communication through digital channels, which is also used for coordination and preparation for crimes (e.g. terrorism) [267]
- Increasing governmental efforts in developing special malware to gain access to metadata or private networks (individuals and corporates)
- Diversification of cybercrime (e.g. fraud, money laundering and blackmail) along with a constant increase of incidents [268]

### Challenges:

- Defining the clear border where national security outweighs individual privacy [123]
- Relevant laws and regulations are vague and ambiguous which leave the companies to fill the gaps with their own judgement [269]
- Transparency about current and planned solutions is neither given for an individual level nor on a corporate level

### Impact on Customer Interaction in the Telco Industry:

In general, the newly passed laws and spy instruments of governments need to be implemented by the service providers as long as the law is not contested. However, the people's awareness and distrust against governments has risen significantly [270]. Therefore, individuals and corporates are concerned about how telco companies handle their data. In the future, corporates in the telco industry need to enlighten their customers about new regulations and should emphasize their data storage and protection solutions. Data encryption needs to be specially highlighted in this context. These solutions will have a direct impact on the potential government access to personal data.

# NET NEUTRALI- TY IN DANGER

## Industry Pressure Threatens to Dissolve the Current Net Neutrality Laws

Net neutrality is the principle that internet service providers and regulation authorities must treat all data transferred via the internet equally. They are not allowed to discriminate or charge differently by user, website, platform, or type of attached equipment. Net neutrality has been legally ensured in a variety of countries over the past 20 years (US, EU, etc.) [271]. Since net neutrality has been introduced in the US back in 2015, protests increased from large telco providers.

Mobile data demand will increase up to four times by 2021 which makes connectivity an even more critical factor for many businesses [272]. The further development of autonomous cars and connected health devices may lead to a differentiation on how important we perceive certain data transfers. An unreliable connection between these new devices can cause severe damages or even death. Telco providers tried to bypass net neutrality laws by using the zero-rating strategy. Data from specific services will not be calculated into the inclusive data volume of a contract. For telco providers, the abolishment would open a big market opportunity by demanding higher prices for a faster internet connection.

### Facts:

- While the German court still has to decide whether telco providers are allowed to prioritize specific multimedia services (e.g. Telekom StreamOn), the Dutch Supreme Court declared the services to be legal [273], [274]
- The EU Article 3.3 offers a loophole for telco companies by allowing them to offer a special level of quality to a limited amount of customers [275]
- US Federal Communication Commission decided in favor of net neutrality back in 2015 (Title II) [276]
- US telco providers attempted to influence the Federal Communication Commission's decisions by giving 572m USD to politicians [278]

- US broadband providers' revenue decreased by 5.6% (3.6bn USD) in the first two years after Title II [277]

### Key Drivers:

- Technological progress of autonomous driving cars, healthcare devices, and other time crucial technologies require highly reliable connection [279], [280]
- Mounting lawsuits from telco companies dealing with net neutrality and zero-rating in US, Germany, and Netherlands [281]
- US sets trends in the technology industry and can cause other nations to follow their decision

### Challenges:

- Abolishment of net neutrality might cost several billions and result in the loss of thousands of jobs in smaller telco providers and infrastructure construction industry [282]
- Higher prices for telco services will increase entry barriers for small and medium-sized enterprises (SMEs) and start-ups [283]
- Public opinion against the abolishment of net neutrality [284]
- European and national laws currently ensure net neutrality in 2017
- Lobbyism resistance from technology companies to avoid rising costs [285]

### Impact on Customer Interaction in the Telco Industry:

The abolishment of net neutrality offers new chances and business opportunities for telco providers by increasing prices for faster connections. Some Providers might focus on offering the fastest connection for a limited number of high paying customers while just offering basic connection quality for the rest. Today, telco companies already launch special mobile plans including special online services (e.g. Spotify) to appear more interesting for customers. In the future, further cooperation between telco and digital service providers will arise to create new offers for customers. Telco providers are going to have full control over services they want their customers to consume and can even hide services from customers by denying other service provider high quality connectivity or refusing to provide connectivity at all [286]. Furthermore, SMEs and start-ups will not be able to afford the fast connection, weakening their offered user experience.

# ECONOMIC TRENDS

## SHAPING THE FUTURE OF CUSTOMER INTERACTION IN THE TELCO INDUSTRY

Catalyst for Different Industries

Network Operator Dilemma

Market Consolidation

Strategies for Vertical Integration

Innovative Entries into Emerging Markets

Digital Workplaces

# ECONOMIC TRENDS

## Shaping the Future of Customer Interaction in the Telco Industry

Connectivity has not only transformed our leisure activities but also the way we conduct business. The internet represents the world's largest marketplace with over 3.6bn users. These users generate transactions worth 2.3bn USD. The total internet economy makes up more than 10% of the Gross Domestic Product (GDP) in developed countries [287]. All of this is enabled by the telco industry, which is a behemoth itself with a market size of 1.5bn USD [288]. Yet, the industry faces a divergence between a growth in demand for services and a decline in profitability. This is because average revenues per user are falling across much of the developed world [289]. In the following segments six economic trends in the telco market are described.

One of the key drivers behind the growth in data volume is the rise of a digital economy. New industries worth trillions of Euros are emerging, all enabled by the constant connectivity provided by telco providers. Yet so far, telco providers have merely been tasked with managing the increased volume, without monetizing the ensuing value addition. The

implemented investments in the telco industry reached nearly 200bn USD in 2013 [290]. Fueled by government agendas and rising customer expectations, infrastructure requirements and costs are continuing to grow. Simultaneously, the commoditization of connectivity is about to continue, reflected in intensified price competition and lower gross margins. The pace and uncertainty of these changes and the longevity of infrastructure investments puts telco providers in a dilemma.

Telco companies are increasingly active in horizontal integration, engaging in M&A activities within their core business model. Key drivers behind this development are the intent to increase economies of scale as well as an increased upselling potential.

Furthermore, we see that telco companies are also actively expanding vertically along the value chain. This expansion can be executed with a variety of strategies: acquiring Over-the-Top (OTT) providers, partnering up with them, or building own products and services. All such strategies are prom-

ising for monetizing the growing demand for bandwidth and mobile data.

The rise in digital business models also impacts the workforce of companies and ultimately the labor market. In the search for talents, companies ought to invest in heightened employee satisfaction and digital workplaces. Digital workplaces represent the key to acquire skilled IT professionals and enhance workplace productivity.

European markets are becoming increasingly saturated and offer fewer growth opportunities. Developing countries, however, are continuing to outperform the developed world in terms of GDP growth. As telco companies are constrained by a limited set of resources, we expect a shift to higher net present value projects in the developing world. Induced by the additional spending on infrastructure, digital business models are emerging across the globe.

# CATALYST FOR DIFFERENT INDUSTRIES

**Connectivity is the Breeding Ground for Modern Industries**

Often seen as a commodity good, connectivity is not a strong criterion of differentiation anymore [291]. What makes a big difference nowadays is how companies use connectivity and the data they generate in their daily business [292]. Through the means of connectivity, new industries have emerged: Fintech, e-travel, e-services, eHealth, e-commerce , connected cars, smart homes, and digital advertising are just a few of them. These industries generate a market size of over 5.2bn EUR worldwide [293]-[300]. In the future, even more value can be generated by connecting these industries. Cars may drive to merchants, pick up goods, pay wirelessly with cryptocurrency, and finally return to their owners. This will fundamentally change customer interaction: Merchants will lose their direct communication channels to the customer. The value chain will become more complex and confusing for the customers. Therefore, new process transparency and customer interaction mechanisms will emerge.

By providing connectivity, telco providers will be the catalyst for new promising industries that are going to shape the future.

### Facts:

- The penetration rate of the connected car market is 5% in 2017 and is forecasted to be 19% with a CAGR of 49% by 2021 [293]

- The digital advertising market has been valued at 205bn EUR in 2017 and the mobile advertisement market is projected to reach 178bn EUR in 2021 [295]
- The smart home market is estimated to be approximately 22bn EUR in 2017, but the outlook is that it will grow with a CAGR of 33% between 2017 and 2021 [297]

### Key Drivers:

- New telco standards such as 4G and 5G will serve as a basis for innovative industries and offer new opportunities for existing businesses [301]
- Social acceptance of digitalization, technology, and AI is a requirement for the growth of the telco market and new connected industries
- Comprehensive solutions are increasingly demanded, and such services would offer even higher value when they were integrated, e.g. Google Maps in connected cars [302]

### Challenges:

- Without homogeneous interfaces, the complexity of connecting all devices and industries is very high [303]
- Heterogeneous industries have different connectivity demands; for mobile IoT devices, the connectivity should be energy efficient, whereas for mission critical industries resilience is the main concern [303]
- High budgets are needed for investing in new technologies but also maintaining old infrastructure, which gets more expensive as the number of different technologies increases [304]

### Impact on Customer Interaction in the Telco Industry:

The industries described above offer innovative ways to interact with customers and influence the way telco providers market their connectivity. The main opportunity comes from cross-selling: an example being the ability to cross-sell in smart houses. The smart house system could recognize that all smart devices within proximity would profit from better connectivity and request offers from different providers. The system would then present these offers to the house owner as a decision basis. This may also be a threat for telco providers if the smart house system uses a price comparison platform to find the best offer for the owner.

# NETWORK OPERATOR DILEMMA

## Infrastructure Investments must Increase while Revenues are Declining

The telco industry requires constant long-term investments in a rapidly changing market environment [305], [306]. Network providers must maintain legacy systems and simultaneously upgrade infrastructure to cope with increasing demand. Global capital expenditures (CAPEX) have more than six-folded over the past thirty years, rising from 50bn USD in 1980 to 325bn USD in 2011 [307].

Telco providers are challenged with the implementation of constantly evolving technology standards, such as 5G [308], [309]. Investments in new technologies are necessary for the operators to secure and expand their customer base, which has a growing demand for data volume in mobile and fixed services [310]. Governments are also interested in a robust infrastructure as it has great impact on the economy, e.g. in the fields of IoT and mobility [223], [290], [310].

In contrast to the increasing demand, revenues are declining which is caused by competitive pressure and regulation [290]. The competitive market has brought on a price war. For consumers price is the main differentiator next to speed and availability [223], [290]. This makes the already CAPEX intensive infrastructure even less attractive and places telco operators in a difficult situation.

### Facts:

- Telco investment has increased steadily in Organisation for Economic Co-operation and Development (OECD) countries, reaching the 10-year highpoint in Germany with more than 8.1bn EUR [290], [310]
- The decline in revenue per communication access path has stabilized in recent years, compared to the years between 2000 and 2010, but is still retracting in OECD countries by 5% to 10% on a yearly basis [290]

- The average monthly data consumption per user doubled in Germany between 2010 and 2015 from 15 GB to above 30 GB and comes along with a shift towards mobile [310], [311]

### Key Drivers:

- Telco infrastructure fosters economic growth and enables almost all other industries to perform better which is why the European Commission and governments set goals for coverage and speed of broadband access [312], [313]
- Demand for broadband is increasing as the digital economy booms and more businesses create value on top of the infrastructure [310]
- Growing direct and indirect competition in saturated markets leads to a downwards trend in prices to attract customers [314]
- Urbanization leads to sparser population in rural and remote areas, increasing per household costs and making investments in these areas less attractive [315]

### Challenges:

- Telco providers must invest in infrastructure to remain attractive to customers, with virtual network providers and OTT providers building their asset-light business models on top of existing infrastructure
- Remote or rural areas, with a low population density, are less attractive for capital intensive infrastructure investments leading to a digital divide [316]
- The goal of the EU Digital Agenda is to reach 100% coverage at 30 megabit per second by 2020, requiring infrastructure investments between 180bn to 270bn EUR [315]

### Impact on Customer Interaction in the Telco Industry:

To escape the network operator's dilemma, telco providers need to find new ways of creating and monetizing customer value. Additional customer value can be generated by personalized offers, intelligent services, and content creation. The added value will result in lower churn rates and strengthen the position of telco providers in a competitive landscape. In addition, willingness to pay will increase and halt the commoditization of connectivity. As a result, telco companies will compete with third-parties for a direct interface to the customer [317].
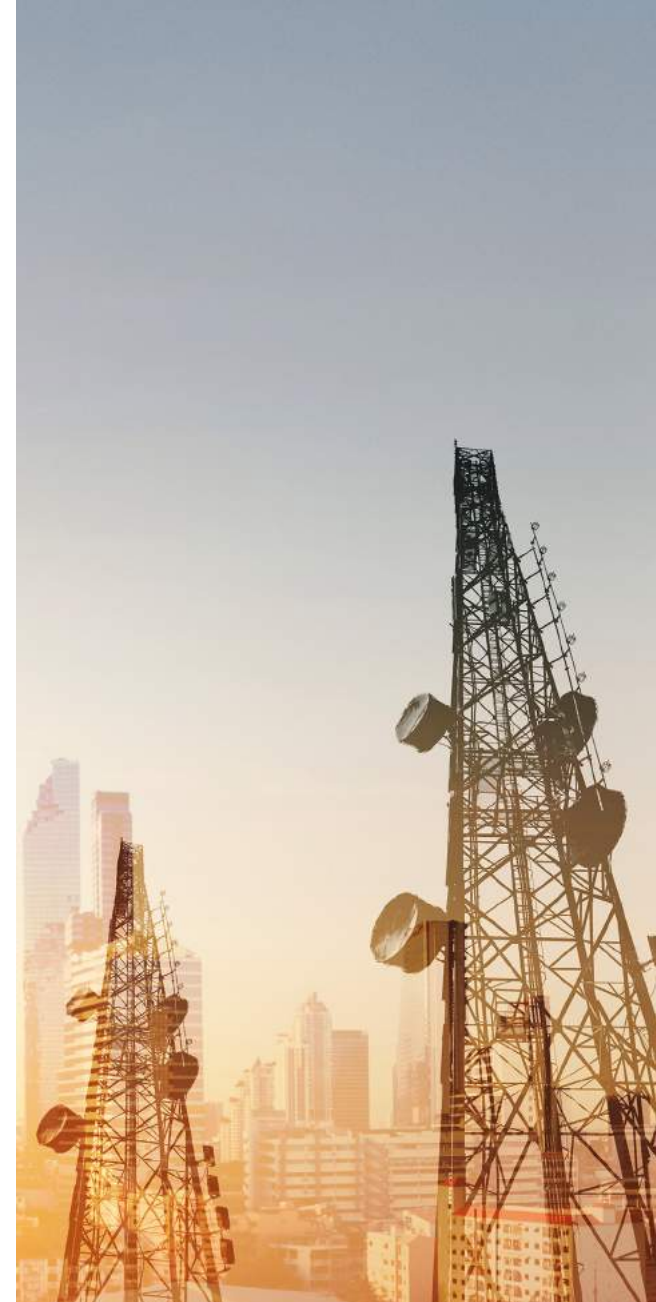
# MARKET CON-SOLIDATION

## Consolidation Continues within the Telco Industry

Telco providers are facing both a falling market volume, as well as a decrease in average revenues per user - down 6% since 2011 in Western Europe [289]. At the same time, investment requirements for new technologies are growing, as are customer expectations. Sustainably raising revenue in the core business without major geographical expansion is a challenge for every company in the industry. Required increases in operating profits to finance additional investments must come from cost reductions. This can be achieved through further consolidation within the telco industry.

Business models of full-stack telco companies are characterized by a high need for infrastructure investments. Especially in the case of landlines fixed costs are substantial, while the variable costs are relatively low. [318]. Thus, adding new customers to the network results in low additional costs. The largest company can establish itself as the price leader with the highest return of sales [319]. Companies can make use of these economies of scale through horizontal integration, bolstering their core business unit.

### Facts:

- Telco companies spent 224bn USD on M&A in 2016 (a 137% increase compared to the previous year) [320]
- 68% of executives in the telco industry state that in-market M&A activities are important to their organization at the moment [321]
- Network & IT integration together with Marketing, Distribution, and Customer Care make up 78% of potential synergy effects which is the main driver for M&A [322]
- Average Debt/EBITDA ratio above 3.5 for Western European telco companies [323]

### Key Drivers:

- Need to acquire new customers in a saturated market, characterized by high customer acquisition costs [324]
- Pressure to increase efficiency in the core business model through capitalization of economies of scale [325]
- Complementing the portfolio to offer consumers a one-stop shop and utilizing fixed-mobile convergence as a competitive advantage [326]
- Low cost of debt in the developed world decreases the cost of acquisitions [327]
- Need to acquire existing infrastructure to enter a new geographical segment or provide new services

### Challenges:

- Integration of new organization into existing structures to realize envisioned synergies [328]
- Significant existing net debt of large telco providers providers [329]
- High valuation of takeover candidates lowers the net benefit of potential synergies in an uncertain market environment [330]
- Difficult regulatory environment complicates future mergers in an already consolidated industry

### Impact on Customer Interaction in the Telco Industry:

The continued consolidation in the telco industry is going to have profound effects on the interaction between consumer and vendor. Firstly, we expect price competition to decline in tandem with the number of potential suppliers, bolstering the negotiation power of telco companies. The decreasing price competition may result in increasing prices and a shift from consumer to supplier surplus.

On the other hand, consumers are going to be able to obtain all necessary connectivity features from a single network operator, guaranteeing seamless interconnectivity. Furthermore, the increased profitability could potentially allow companies to invest additional funds into infrastructure, further enhancing customer experience.

# STRATEGIES FOR VERTICAL INTEGRATION

## Different Strategies Emerge for Dealing with OTT Services: Partnerships and Developing own Applications

Nowadays, the products, services, and content offered by OTT companies like Netflix or Whatsapp are part of the everyday life of millions of people. OTTs are diversifying their own service propositions and are consistently growing their share in the telco industry, having reached the 10% mark in just a few years [331]. Their four main areas of action are mobile voice, messaging, media, and cloud services [332].

The success of OTTs in former core areas of telco operators has resulted in price and product erosion, impacting both revenues and margins [331]. At the same time, the continuous growth of OTTs has led to more demand for bandwidth and mobile data. To benefit from this growth, telco operators have started to partner up with OTTs [333].

However, the question is still who benefits the most from these partnerships? WhatsApp, Facebook, and Instagram already outgrew eight major telco operators in terms of subscribers [334]. In addition, OTTs exploit customer data in a smarter and more efficient way. This indicates a shift of market power towards OTT companies. To gain back a stronger position, telco providers are considering to invest and move into new verticals [335], [336]. With this move, operators would not only generate additional revenue streams but also acquire more customer data.

### Facts:

- 328 OTT partnerships have been established in 2015 – 72% of them are partnerships with content providing partners [333]

- The demand side for OTT services is accelerated by digital natives, who spend 315 minutes online each day (vs. 126 minutes for customers over 25 years) [337]
- Telco companies partner up to increase reach and to bring innovative services and products to the market [338]
- With 2.55bn active users combined, Facebook, WhatsApp, and Instagram already outgrew the eight leading telco operators in their combined user numbers [334]

### Key Drivers:

- Low barriers (e.g. investment costs) for OTTs to enter the telco market [339]
- Telco operators are experiencing stagnation in their core market and searching for further growth [335]
- Mobile voice over internet protocol apps such as Skype, Viber, and Google Talk attack another core industry of telco companies [332]

### Challenges:

- Telco providers must acquire talent and industry knowledge to be successful in investing in other verticals [331]
- In partnerships, the challenge lies in accessing the partner's market value as well as to provide sufficient leverage for the partner to be attractive themselves [333]
- Telco operators must prepare their own infrastructure to be state-of-the-art, so that OTTs are willing to partner up [333]
- For telco operators who start providing their own services, it will become difficult to crack open lock-in effects, that OTTs usually establish

### Impact on Customer Interaction in the Telco Industry:

OTTs are known for their great customer experience. This implies that telco providers must offer at least the same experience, when they bring new products to the market. This is already on their agenda: 68% of senior executives of telco companies are focusing their strategy on customer experience management [331]. If they choose to partner up, the customer interaction will still be defined by the OTTs. In both cases, customers are the winning party, since there will be a rise in the quality of customer interaction [331], [340].

# INNOVATIVE ENTRIES INTO EMERGING MARKETS

**Opportunities for Increased Consumer Empowerment by Providing Connectivity and Innovative Telco Solutions**

As economic conditions improve in a country, investments become more attractive and new telco markets emerge. For example, Africa has recently experienced the fastest growth in mobile subscribers worldwide [312]. A rising teledensity in turn contributes to a growing GDP and enables new businesses. An example hereto is the mobile pay service M-Pesa that was launched by telco providers in Kenya. It allows people to transfer money via cellphone and has become the most successful scheme for mobile payments worldwide [341]. With M-Pesa, telco companies have entered banks' core business. On the other hand, service providers of adjacent sectors, such as media groups, want to profit from mobile connectivity as a new channel to the market [312].Both local and global companies and both traditional network operators and new entrants try to enter emerging telco markets. An example is Google X's research project "loon": Balloons shot in the stratosphere shall provide internet to rural areas. Local telco companies partner and provide internet for the balloons [342]. The trend in emerging markets seems to be both an overall competition as well as a partnership between companies of different sectors, which either provide connectivity or use it to enable their businesses [312].

## Facts:

- More than 60% of senior executives of telco companies stated their interest to invest in new geographic markets, e.g. with special focus on the Middle-East, North Africa, and the Asia-Pacific region [321]

- Worldwide there are 4bn people without internet access, the main reason being simply the lack of infrastructure, especially in rural areas [343]
- In 2017, only 0.3m new mobile subscriptions were registered in Europe compared to 161m in the Asia-Pacific region, and 50m in Africa; although these emerging markets are maturing, and subscription rates in turn are dropping [344]

## Key Drivers:

- For telco infrastructure projects, the returns on investment were identified to stand at 30% to 40%; this number tends to be higher for low-income countries [345]
- Opening of markets, governmental subsidies, and international endeavors bring new incentives for investments in emerging markets [312]
- As GDPs grow (6.7% in emerging Asia, 5.5% in Africa) and more people enter the middle class, the number of potential clients rises [312]

## Challenges:

- High investment costs for network provisioning in fragmented markets and a high price-sensitivity limit the revenue potential for telco providers [321], [346]
- A combination of decreasing subscriber growth rates and decreasing revenues per user impede the revenue growth [312]
- Many of the still unconnected regions are fragmented and landlocked settlements, which leads to high investment costs, but little revenue outlook due to low purchasing power [345]

## Impact on Customer Interaction in the Telco Industry:

In emerging markets, companies have to focus on their customers' essential needs. By providing innovative solutions, they empower their customers to interact in new ways. As there is little demand for cost intensive landlines, they almost solely focus on mobile networks [347]. By offering integrated services such as M-Pesa, the customer base and loyalty increases. Telco providers have to consider special conditions in emerging markets, for instance high adult illiteracy. One solution to interact with them is the provision of voice-based service apps [346]. By offering customized solutions, customers will perceive telco companies not only as commodity providers, but rather as valuable partners.

# DIGITAL WORKPLACES

## Organizations further Develop Digital Workplaces to Increase Employee Satisfaction

Today's employees have higher demands of their working environment: the generation of digital natives as employees wants to have the same speed of internet and the same digital experience they are used to as customers [348]. Most employees demand and expect an increasing flexibility in terms of working hours and the workplace itself [349]. Evidence of this trend is the growing number of so-called digital nomads [350]. Based on these trends on the labor market, market research and consulting companies predict that most organizations have to offer digital workplaces in the future [351], [352].

How can organizations benefit from implementing digital workplaces? Benefits of digital workplaces and improved employee experience are often perceived as intangible [353]. As a result, organizations tend to focus on the customer experience and operational efficiency, rather than employee satisfaction. But digital workplaces lead to gains in workforce productivity, in the recruiting of scarce talent, in employee satisfaction and retention, as well as in collaboration, and the sharing of best practices [353], [354]. Given these advantages, more organizations are committing IT budgets to supporting digital workplace strategies [354]. The biggest enablers are teleco services and cloud-based services [351], [355].

### Facts:

- 64% of employees would choose a job with a lower wage, if they could work away from the [356]
- Organizations that installed social media tools internally found a median 20% increase in employee satisfaction [357]

- 72% of global businesses report that increased productivity is a direct result of flexible working practices and in most cases, it has even led to the staff generating increased revenues [358]

### Key Drivers:

- The shortage of talent, especially in key niche areas such as data analytics, digital designers, and app development, is growing [353], [360]
- In their private life, employees use their smartphones and tablets for a variety of tasks and want to transfer the same experience to work [353]
- Opportunities for companies to scale their operations more quickly and efficiently are created by the virtualization of organizations [353]

### Challenges:

- Benefits of the digital workplace are hard to assess in a ROI and KPI-driven business environment (e.g. increase of productivity, improvement of employee satisfaction) [353]
- Organizations have to deal with a diverse spectrum of requirements and needs of their workforce due to changing demographics [354]
- Trainings and policy frameworks must be installed to ensure that personal data is handled properly and that a violation of the organization's policies is avoided [354]

### Impact on Customer Interaction in the Telco Industry:

The customer does not separate his online and offline experience with a product or service. The main challenge for organizations is to make sure that the customer experience remains the same, no matter which channel the customer chooses. For this reason, customer-facing employees need to have access to all channels that the customer is using. Without this access, employees are not able to provide value added services and information. Including digital channels ensures that the brand delivers a first-class and seamless experience, whether through an app or during the conversation with an employee at an offline point of sale [348].

# BUSINESS MODEL TRENDS

## SHAPING THE FUTURE OF CUSTOMER INTERACTION IN THE TELCO INDUSTRY

Servitization

Platform Economy

Rise of Connected Devices

Predictive Analytics in Customer Interaction

Personalization of Products

Omni-Channel

Machine-to-Human Customer Interaction

# BUSINESS MODEL TRENDS

**Shaping the Future of Customer Interaction in the Telco Industry**

Business model innovation has experienced a paradigm shift in recent years, driven by increased connectivity, growing data streams, and more sophisticated technologies. Today the average customer demands more from his products and services. Telco companies need to reposition themselves in a way to not be left behind in this new challenging business landscape. They must utilize their position and innovate, not only in their internal processes, but also externally by expanding along the value chain and leading the way into an innovative future. One way to achieve innovation is to re-think their role from product providers to service providers. Customers are not only consuming products anymore, but also the experience associated with it. End-to-end service experiences for example, enable differentiation between telco companies in an increasingly competitive market. Therefore, they must follow the trend and delve into business models centering on servitization.

Similarly, consumers increasingly demand centralized customer interaction with platforms. More and more, they look towards platforms to search for the information they require. Because of their size, telco companies are in an ideal position to build such platforms and to unlock new revenue streams. This leads to a vertical expansion in the value chain and can also be used as a gateway into other industries.

The IoT has revolutionized connectivity and is a further key driver in current business model shifts. There are multiple opportunities for telco providers to monetize connected devices through machine-to-machine (M2M) communication, consumer-to-machine communication, and utilized IoT-generated data. There is also a huge opportunity for telco companies to expand vertically into the value chain and provide a completely integrated all-in-one IoT solution.

Not only can telco providers utilize data from IoT devices, they can also leverage already existing customer data, using increasingly available predictive analytics and personalization capabilities. Through data-driven strategies, telco companies will make smarter and more effective decisions. On the one hand, predictive analytics can be utilized to ascertain customer trends for enhanced customer experience and innovation. On the other hand, existing services and products can be enhanced and individualized through data-driven personalization. Alongside keeping up with the online world, telco companies must also pay attention to the offline world. The shift towards omni-channel customer interaction is important, as customers look for a consistent experience throughout all touchpoints. Customer data should be consolidated across the organization to provide a seamless online-to-offline experience and vice versa.

Finally, not only are customers demanding omni-channel support and personalized services, there is also a trend towards smarter and automated customer interaction with AI bots. Telco providers should develop such interaction agents to keep up with modern times and cope with increasing customer demand. In addition to providing better customer service, these smart agents make customer care easier and cheaper.

# SERVITIZATION

**From Products to Services: Increasing Service-Oriented Paradigm of Business Models**

Servitization describes the shift in customer behavior towards consuming services instead of buying products [361]. This shift is due to increasing international competition and high market saturation, which lead to decreasing margins and profits for traditional production companies in various sectors. Price differentiation is a key factor for consumers' purchasing decisions, especially in industries with products considered a commodity [362]. To differentiate, companies increasingly offer end-to-end services, which consist of customer focused packages of goods combined with additional support and knowledge. When consuming a service, customers experience the benefit directly instead of buying a product [363]. The trend towards offering full-service solutions can be observed throughout various industries [363]-[366]. Examples range from the mobility industry (car sharing) to software industries (Software-as-a-Service (SaaS), instead of on premise licenses) [367], [368]. For instance, Hilti, known for their drilling machines, has a full-service offering for construction workers now instead of just producing and selling machines [369].

Through services, companies can provide seamless and enhanced customer experiences and add additional customer value. Service business models enable companies to differentiate and therefore give the chance to increase their profit and growth potential.

## Facts:

- SaaS sales make up a quarter of the software market in Germany in 2017, with sales forecasts of reaching 9bn EUR by 2019 [370], [371]
- The number of car sharing vehicles quadrupled from 3,200 cars in 2009 to 17,200 cars in 2017 and 1.8m car sharing customers were acquired in Germany until 2017 [367], [372]

- AirBnB offers traveling experiences rather than just accommodation, with a doubled number of annual bookings from 2014 to 2015 adding up to 80m bookings per year [373]

## Key Drivers:

- Shifting consumer behavior towards collaboratively consumed services, with a focus on the experience while using the product [361], [364], [See Society Trends: Generation of Sharing & Experience]
- Decreasing profits for companies selling products in traditional ways, along with consumers' high willingness to pay for services [362]
- A growing number of OTT content providers, such as WhatsApp, WeChat, and Viber [14] and increasing vertical integration [374], [See Economy Trends: Strategies for Vertical Integration]

## Challenges:

- Implementing new activities in customer service to help customers while adopting new services [365]
- Difficulty of reaching a critical mass of customers and high upfront investment cost in infrastructure keep companies from implementing service business models
- Building up capabilities and acquiring new skills that are required to build up end-to-end services

## Impact on Customer Interaction in the Telco Industry:

Teleco is often considered a commodity by end customers. Consequently, price is a key differentiation criterion and makes customers pick the cheapest contract with almost no attention to the provider [362]. To tackle the problem of shallow customer relationships, additional services can be created to deliver value to the customer.

By becoming a service provider, telco companies can also spread along the value chain: e.g. a telco company could offer an entertainment service based on their connectivity infrastructure, leading to direct interaction with end customers. This will enable telco providers to become more visible to customers and will allow them to differentiate from competitors. An increase in brand loyalty can then lead to additional growth opportunities and an increasing margin potential.

# PLATFORM ECONOMY

## Centralizing Customer Interaction and Unlocking new Revenue Streams

A platform provides rules and infrastructure where demand and supply meet [375]. On the supply-side, providers offer the platform an interface for interaction with users, while producers create offers on the platform such as services or applications. On the demand-side, the consumer is the buyer or user of offerings. Once users create value for other users on the platform, network effects arise. These lead to demand-side economies of scale [376].

Today, the world's most valuable companies by market capitalization are platform companies including Alibaba, Amazon, Apple, Microsoft, Google, and Facebook [377]. By 2018, more than 50 percent of all large companies will have their own industry platforms or will partner with one [378]. For example, Alibaba provides an e-commerce platform, where manufacturers from countries such as China or Pakistan can connect directly with international buyers [379]. Ensuring that suppliers and customers have a high value in using the network, enables platform companies to form strong relationships with their customer base. Such a network may open up new revenue streams through offering new services, entering other markets, or monetizing data [380].

### Facts:

- The App Store by Apple offers 1.4m apps and has cumulatively generated 25bn USD for developers [375]
- Xiaomi had a market capitalization of 45bn USD with a platform business model after only 4 years [381]
- The top 15 public platform companies represent 2.6tn USD in market capitalization worldwide [361]

- Alibaba accounts for over 75% of Chinese e-commerce transactions and Google for 94% of mobile search [362]

### Key Drivers:

- Decreasing costs of information technology make it vastly quicker and cheaper to build scalable platforms platforms [375]
- An increasing number of customers, who spend time using digital platforms for communication communication [337]
- Growing network effects in internet economies generate significantly more value for companies with a greater customer base [375]

### Challenges:

- Acquiring the necessary number of users on a platform and ensuring high engagement to generate network effects [375]
- Generating high quality matches of supply with demand of customers to reduce churn rates [382]
- Providing the right extent of openness on a platform regarding players and the freedom of their interactions [376]
- Avoiding negative experiences, which lead to negative network effects that diminish value of the network quickly quickly [375]

### Impact on Customer Interaction in the Telco Industry:

The value for the customer is created by harnessing the synergies of all stakeholders with meaningful [380]. This enables telco platforms to build strong customer bases and establish strong relationships by opening a new channel to interact with customers. The data on engagement and interaction of customers can be used to build new services or offerings. A broad customer base on a platform can be used to extend vastly into new industries or markets, such as healthcare, smart mobility, or consumer-retailer networks [337]. New services and expansions in other industries enable telco providers to build new revenue streams and provide the basis for new vertical roles in the value chain, such as hosting, application enablement, and application services.

# RISE OF CONNECTED DEVICES

## Emerging Monetization Opportunities Enabled by the IoT

The rise of connected devices leads to new monetization opportunities along the IoT value chain [383]. Development is happening in the area of M2M communication, also called Industrial Internet of Things (IIoT), and also in human-to-machine (H2M) communication. Consumers are able to interact with devices in their environment directly. In the area of security and comfort (e.g. "smart homes") and even in terms of health data or sports data (e.g. "quantified self") the lives of customers can be significantly simplified [384]. Businesses mainly use M2M communication to increase internal efficiency, optimize the use of machines and finally pursue cost savings. For example, Siemens AG invested over 10bn EUR within the last 15 years into Industrial IoT and achieved nearly 75% automation in some production plants [385].

A side effect of the increase in IoT devices is the creation of massive amounts of customer data which can potentially be monetized [See Business Model Trend: Personalization of products]. Players in the area of the IoT have the opportunity to expand into different areas of the value chain, such as manufacturing, services connected to IoT devices, and the provision of an IoT platform [383].

### Facts:

- IoT driven revenue in Germany is expected to grow with a CAGR of 33% from 9.2bn EUR in 2014 to 50.1bn EUR in 2020 [386]
- Companies globally are expected to invest almost 1.3tn USD in IoT applications in 2020 [387]
- The consumer market of wearables is expected to grow significantly with a CAGR of 17% between 2017 and 2021 with 221m devices to be sold in 2021 [388]

### Key Drivers:

- Decreasing costs for connectivity and data result in an overall increase of data usage [389]
- Reduced costs for IoT hardware devices and services fuel the development of new IoT technologies [390]
- Increasing demand for connectivity in industry and households [391], [See Technology Trend: Internet of Things]

### Challenges:

- Increasing demand for connectivity, while the return on investment in telco infrastructure is decreasing steadily [See Economy Trends: Network Operator Dilemma]
- Rising difficulty to establish a leading position within the IoT market, due to no established standards in the industry [392]
- Increasing privacy concerns by customers. The way how sensitive customer data is handled will become a differentiator between players [393]

### Impact on Customer Interaction in the Telco Industry:

Telco providers have the comfortable position to participate in the IoT value chain in different stages: One potential monetization opportunity in the IoT value chain can emerge from the offering of Service Level Agreements (SLA) connected to "Quality of Service" promises. These agreements could be offered for security-relevant infrastructures (e.g. tele-medicine, self-driving cars) [383]. Telco providers could integrate vertically with IoT business to business (B2B) platform providers. Revenue can then be generated through cloud hosting, data analytics, and reporting tools based on IoT generated data. Specific customer solutions can also be easily added through the on-boarding of IoT specialized partners [394]. To cover the complete IoT value chain telco providers are potentially able to offer integrated all-in-one solutions for end-customers (e.g. "Smart Home") or business partners (e.g. automated manufacturing). Requirements to provide an all-in-one solution are extensive internal IT capabilities [389], [383].

# PREDICTIVE ANALYTICS IN CUSTOMER INTERACTION

## Rising Data Analytics Capabilities Enable new Monetization Opportunities

Predictive analytics encompasses all techniques that extract information from data and use this information to forecast future patterns [395]. The trend has been on the rise for years and is starting to bear fruit with the availability of inexpensive computational power, complex algorithms that can decipher large datasets, and vast amounts of data. The question for businesses is how to leverage this data to gain valuable insights for strategic purposes. Digital companies such as Facebook and Google have proven business models with advanced predictive analytic techniques for targeted advertising campaigns on their platforms [396]. Furthermore, data-driven decision making is being embraced across industries: banking, marketing, healthcare, manufacturing, and government are already benefiting from incorporating predictive analytics into their workflows [397]. Consequently, the global big data and data analytics market is growing steadily [398]. Through predictive analytics, corporations are able to provide enhanced services to their customers along with lower costs and improved effectiveness [399], [400]. As a result, large investments in predictive analytics are becoming increasingly attractive.

## Facts:

- Global big data and business analytics revenues were 130bn USD in 2016 and will more than double until 2022 [398]
- It is 4.5 times more likely that strong innovators leverage predictive analytics for innovation rather than companies with a low innovation rate: more than 65% of strong innovators mine big data or social networks for ideas [401]

- According to industry analysts, by 2020 there will be approximately 20bn networked devices worldwide [402]
- The amount of data traffic globally will reach 3.3 ZB in 2021 as compared to 1.2 ZB in 2016 [403]

## Key Drivers:

- Increasing IP traffic and more connected devices worldwide are leading to an increase in the amount and complexity of data produced [403]
- Growing numbers of sophisticated predictive analytics algorithms and capabilities for application in business [404]
- Increasing computational power to handle advanced predictive analytics algorithms on big data [405]

## Challenges:

- Acquiring appropriate skills due to a shortage of data scientists: The number of jobs for all US data professionals will increase from 364k openings in 2017 to 2.7m in 2020 [406]
- Consolidating heterogeneous and unstructured sources of data across an organization: it is estimated that 80% of enterprise data today is unstructured [407]
- Increasing concerns about privacy and security challenges [393], [408], [See Legal Trend: GDPR]

## Impact on Customer Interaction in the Telco Industry:

Predictive analytics techniques allow telco providers to strategically position themselves to bring the biggest value possible to customer interaction. The most prominent use-cases include churn prediction, fraud analytics, network management and optimization, personalized sales and marketing, and better product innovation [409]. For example, one US communications service provider utilized data analytics to improve customer experience, which resulted in savings of 15m USD per year [410]. Telco providers are in a unique position to leverage data in new and innovative ways. Not only can they use it to optimize their own internal processes, provide better customer care and more effective marketing campaigns, they can also use the data to innovate along the value chain. The possibility of innovating new products and services based on real-time usage patterns has a multi-billion dollar revenue potential [411]. Even further revenue potential lies in the data marketplace, where aggregated data and insights can be sold at a premium.

# PERSONALIZA-TION OF PRODUCTS

**Increasing Product Sales by Segment-of-One Focused Activities**

Personalization is the practice of providing a tailored and customized experience based on an individual customer's data. In contrast, traditional marketing and sales techniques revolve around building broad segments of the target customer base, leading to unrelated and decontextualized product advertisements. Personalization solves this problem by using the segment-of-one approach and providing more tailored, relevant offerings to the customer. For example, Coca Cola leveraged personalization, increasing its sale volume for the first time in four years, by printing names on their bottles with its "Share a Coke" campaign [412]. Similarly, digital companies such as Amazon use their personalized recommendation engines to create a curated experience for their customers and increase sales volume [413]. Individualized one-to-one marketing can increase customer engagement, customer experience, conversion rate, and brand perception [414]. All of this makes personalization an effective tool for corporations to increase sales and revenue [413].

## Facts:

- From 2016 to 2017, personalization helped to triple Starbucks' marketing campaign results, doubled email redemptions, and increased spending on redeemed offers [415]
- Spotify's personalized "Discover Weekly" service was used by more than 40m people, streaming approximately five billion tracks in 2016 [416]

- Nivea improved its browsing conversion rate by 70% and transactions by 150% by implementing personalization on its Alibaba storefront [415]

## Key Drivers:

- Rising customers´ demand of personalized online customer experiences [See Technology Trend: Online Personalization]
- Increasing customer demand for tailored and curated services putting pressure on organizations to move away from traditional marketing [417]
- Growing computational power, development of sophisticated analytics algorithms, and ubiquitous customer data available for analysis [405]

## Challenges:

- Rising concern and awareness regarding privacy and security [See Legal Trend: GDPR]
- Increasing difficulty to relate heterogeneous, scattered data points back to individual customers [414]
- Restricting lack of resources and technical know-how to implement large scale solutions [416]

## Impact on Customer Interaction in the Telco Industry:

Similar to other sectors, telco companies have to keep up with increasing customer expectations regarding personalized marketing and services. By leveraging customer insights from various business to customer (B2C) interactions in different channels, telco providers can offer a highly individualized and engaging experience to their customers. This will drive up revenue and profit, as suitable product offerings can be pushed to relevant customers. Additionally, with the onset of omni-channel commerce [See Business Model Trend: Omni-Channel], personalization truly reaches its potential by connecting various touchpoints in the online and offline worlds [418]. Lastly, diversification and innovation along the value chain by telco providers can become more effective by embedding personalization as its foundation.

# OMNI-CHANNEL

## Seamless Customer Interaction Between Offline and Online Worlds

Many retailers face the challenge to connect the new online world with the former brick-and-mortar offline world to fulfil consumer needs [419]. By connecting online with offline channels, retailers create more customer touchpoints and are therefore under pressure to create a seamless customer journey.

For example, Walmart spent 1.1bn USD in 2017 compared to 0.7bn USD in 2015 on activities to increase the connection between their stationary point-of-sales and their online business. These activities include initiatives such as order and store pick up, a faster fulfilment network, and building new data capabilities to enhance customer experience [420]. Especially businesses with an established stationery retail network and an online shop have the opportunity to match data from in-store visits to online data of specific customers. These enables retailers to improve their services and therefore their customer value proposition [421]. The connection of multiple channels through customer data is necessary to satisfy changing customer needs and generate revenue in the future.

### Facts:

- In 2017, 46% of German consumers still prefer stationary shops as a sales channel, but 64% of German consumers research online and purchase offline [422], [423]
- Online sales grew with a CAGR of 16.3% from 27.6bn EUR in 2012 to 58.8bn EUR in 2017, which accounts for 7.9% of total retail sales in Germany [424]
- Amazon acquired Whole Foods for 13.7bn USD to expand their omni-channel capabilities [425]

### Key Drivers:

- An increasing number of customers use multiple channels during their shopping journey and expect a seamless experience across all channels [426]
- A growing amount of customer data and increasing analytical capabilities to generate insights about customers [See Technology Trend: Online Personalization]
- An increasing number of tech-savvy customers, who are enabled to interact with retailers through multiple channels [427]

### Challenges:

- Increasing importance of data analytics and back-end excellence as a key requirement to offer valuable services and products to customers [419]
- Changes in behaviour and mind-set within companies and their sales channels are needed [419]
- Rethinking store formats to create an engaging experience for customers as well as to attract new customers [419]

### Impact on Customer Interaction in the Telco Industry:

The extensive stationary shop networks of major telco companies, in combination with their collection of customer data, provide an opportunity to implement omni-channel marketing and sales strategies. Telco companies can match stationery and online data points from the same customer through their ability of tracking customers. These insights into customer behavior in real time, enable personalized offers, which ultimately decreases mistargeting and generates more value for customers. Telco providers could integrate vertically in the value chain and offer consultancy in omni-channel management to other retailers. Their ability to match stationery and online data points in real time is a service which can only be provided by telco companies and is of interest for the whole retail industry.

# MACHINE-TO-HUMAN CUSTOMER INTERACTION

**Emerging Monetization and Cost-Saving Strategies Through AI-based Bots**

AI based bots allow people to interact with systems in the same way they would communicate with humans [428]. This is especially interesting for customer interaction due to the high labour costs in customer support. Especially for customer service, where similar questions are frequently asked and service is required at any time. Assigning these questions and tasks to AI-based bots allows more efficient interactions with customers, as they analyze vast data sets from different sources much more quickly than humans. Nowadays, customers already use personal assistants and bots, such as Amazon's Alexa, Apple's Siri, and Google's Assistant. For example, users can order by just speaking to Alexa. Having this interface gives customers an easier and faster access to information and services at all times [429].

Assigning simple and cost-intensive tasks to bots allows a company's workforce to focus on providing value for customers. Giving customers what they need, exactly when they need it, leads to higher customer satisfaction resulting in higher revenues [391], [430]. Combining AI-bots with the customer care workforce enables companies to answer more requests and ultimately optimize the care for customers, leading to higher customer satisfaction and therefore additional upselling opportunities.

## Facts:

- Mya, an AI recruiting chatbot improves recruiter efficiency by 38% and increases candidate engagement by over 150% [431]
- Users of Amazon Echo spend about 10% more on Amazon and make purchases 6% more frequent than before [432]

- IDC calculates that AI associated with Customer Relationship Management activities will boost global business revenue by 1.1tn USD from 2017 to 2021 [429]

## Key Drivers:

- Growing processing power, lower cost of hardware, exponential availability of data [388]
- Increasing willingness of customers to speak to mobile devices and accept smart devices
- Rising connection to other devices via IoT along the value chain and therefore high data availability for AI devices [391]

## Challenges:

- Increasing importance of trust and transparency: more open and transparent relationship with consumer, who could force to get a degree of control over data [433], [391]
- Integrating an AI interface as primary source of interaction: Implementation in data supply chain and value chain has to work smoothly and has to have an effective AI algorithm to satisfy customers
- Growing difficulty to find the threshold, when to switch from machine-to-human interaction to human-to-human interaction for more difficult and personal customer problems

## Impact on Customer Interaction in the Telco Industry:

An AI-based engagement with customers and first touchpoint for questions of customers bring an enormous reduction of labor costs for telco companies. AI combined with ML and chatbots, can provide an improved customer experience, due to a digital analysis of the customer's problem and a faster and easier solution [434], [429]. The connection of AI-based customer interactions with the value chain of telco providers can make internal processes and problem solving even faster. With this impact of AI on customer interaction, the usage of AI-based bots can be a huge strategic advantage for telco companies, due to cost savings and efficiency improvements. AI-based chatbots and services in general generate significant amounts of data that can be used for improvements of existing services or the implementation of new offerings [411].

# SCENARIOS

The following chapter describes four scenarios of different futures. The chosen scenarios are plausible, relevant, and of consequence for the user's decision, challenging, internally consistent, and recognizable from the signals of the present and near future. All four scenarios described below are equally plausible, extreme visions of how creating and sustaining habits might look like in the year 2037 with regards to two key drivers. Stories of personas experiencing a day in 2037 are used to envision the scenarios. Signposts (often described as weak signals) that indicate a development towards each scenario are identified in order to describe a possible path from the present to each of the four extreme futures.

# DRIVER MATRIX

The scenario building phase follows a structured approach. Based on the research from the basic phase of the Trend Seminar, current drivers and its resulting challenges for the future development of customer interaction in the telco industry are identified.

Drivers are forces that shape the future of customer interaction and that are usually exogenous to an organization. All identified drivers are modeled with bipolar extreme outcomes. In order to create four equally plausible scenarios, two key drivers are combined in a scenario matrix [See Scenario Matrix]. The key drivers are characterized by a high impact on the future of customer interaction in the telco industry and a high degree of uncertainty (i.e. it is impossible to assign a higher probability to one of the respective outcomes). Furthermore, the key drivers are independent of each other and do not overlap.

In order to select the most suitable key drivers, all drivers are ranked in a matrix according to their impact and degree of uncertainty. Different combinations of potential key drivers are then compared and the best combination of key drivers is chosen.



A scatter-style matrix plotting drivers on axes of Impact (vertical, low to high) and Uncertainty (horizontal, low to high):

- Free Internet Access
- Net Neutrality
- Hyperconnectivity
- Monetization of Personal Data
- Customer Access
- Social Acceptance of Tech
- Data Privacy
- Customer Empowerment
- Trust in Institutions
- Smart Environment
- Sharing Economy of things
- Differentiation of Business Models
- Modularization

# KEY DRIVERS

### Full Data Privacy

In a world with full data privacy, the protection of the personal data of consumers has the highest priority. This means that neither companies nor governments are allowed to access personal data in general. However, governments can access data for basic administrative tasks, but explicitly not for any form of surveillance or tracking. Additionally, companies can be granted a one-time access to specific data, e.g. when a customer places an order with a registered account. As a consequence of not being able to access personal information, companies cannot monetize their user's data by, for example, analyzing or profiling customers. Therefore, some companies are now charging for services that they were traditionally offering for free. Additionally, it prohibits companies from targeting customers with personalized advertisements or offers.

### ← Data Privacy →

Data privacy can be defined as the appropriate use of sensitive personal information. In this report, the focus lies on the extent to which personally identifiable information of consumers can be accessed by corporations and governments for their own interests. The extent is mainly influenced by two factors: government regulations and consumer awareness regarding sharing and processing of personal data. Laws and policies define the regulatory framework in terms of data protection in which consumers, companies, and governments operate. Consumers' concerns influence both the extent of their sharing behavior and the election of policy makers who align with their interests. Additionally, technical capabilities, economic viability, and public safety influence the extent to which sensitive information is accessed by governments and corporates.
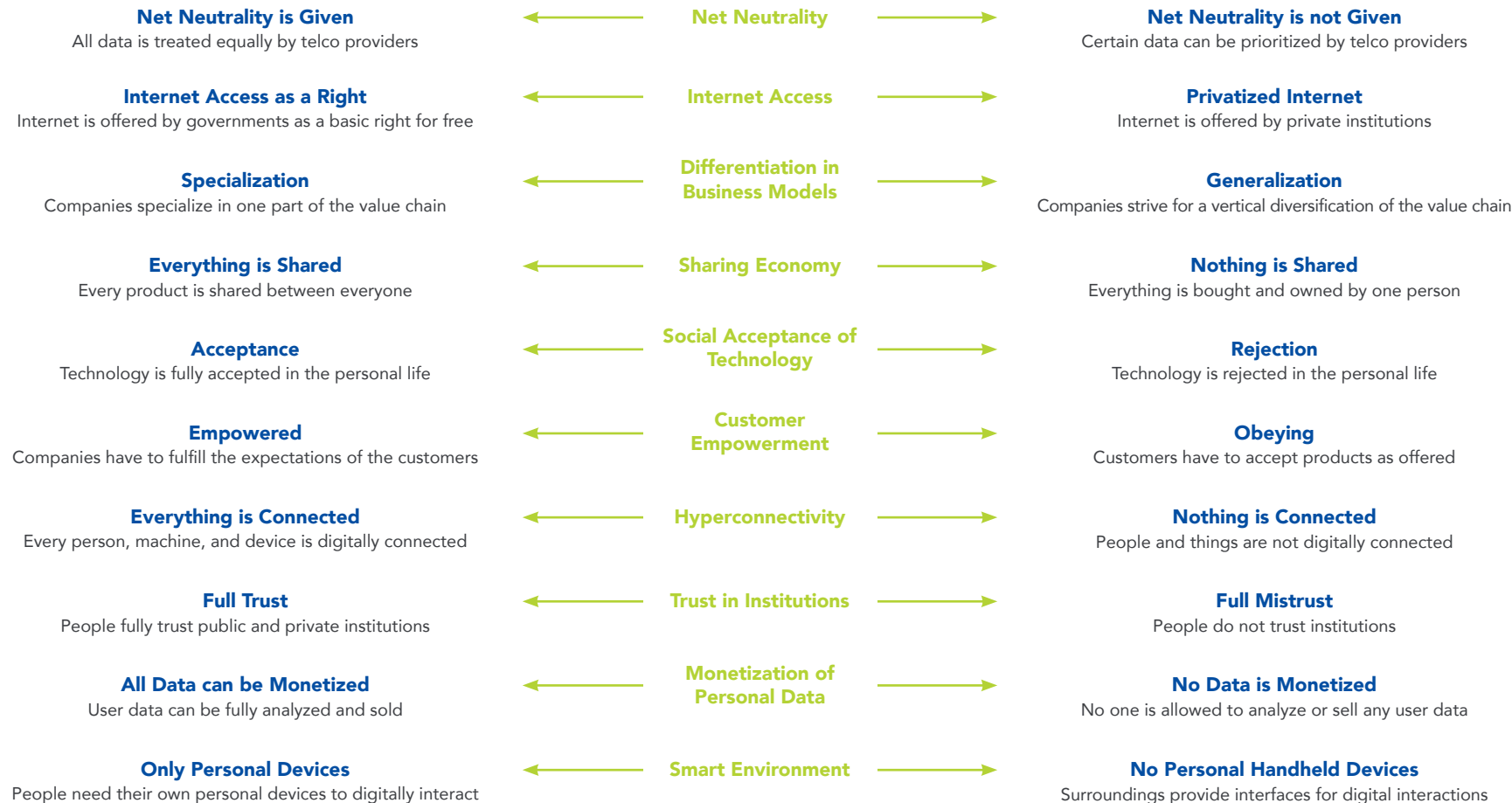
### No Data Privacy

In a world with no data privacy, companies and governments are free to do as they please with consumer data. Access is not restricted in any sense: Data can be used for administrative tasks, monetization purposes, and even surveillance and tracking. There is extreme growth in data-driven business models which leverage increasingly sophisticated predictive analytics algorithms. As cross-industry data selling is common, organizations have a more holistic view of the customer, which they use to establish new and innovative revenue streams: e.g. individualized products and targeted marketing campaigns are now the norm in the business world. While all of this leads to better economies and higher profits, there is also increased competition on the market.

### Centralized

In this extreme scenario, customer access is fully centralized. All customer interaction across companies and industries is handled by a single intermediary. There is no direct interaction between customers and suppliers. This extreme scenario has profound effects on companies and consumers alike. Through the intermediary, consumers can directly compare all options. This direct and complete overview leads to total market transparency. Therefore, complete centralization is characterized by a significant shift in market power towards the intermediary. Customer loyalty and profits are both affected by the intermediary.

### ← Customer Access →

Customer access is defined by the intensity and directness of the interaction between customers and companies. The term "customers" refers to both individual persons and companies. Precisely, the customer access of an individual company is measured by the number of active access points as well as the specialization and frequency of interaction with customers. This number is for instance determined by the company's marketing channels and the addressed customer groups (B2B/B2C). Direct customer interaction is predominantly influenced by the number of intermediaries and the strategic roles these intermediaries play in the market. Intermediaries act as a link between supply and demand of goods and services, thus decreasing the transaction costs in the market. Their number and importance is dependent on the economy as well as regulation and law. Intermediaries reduce the number of direct owned customer access points by companies.

### Decentralized

In this extreme scenario, both a very large number of intermediaries, as well as a very high number of direct customer touch points exist between suppliers and customers. The degree of customer access for each company is limited, as customers seek different intermediaries and suppliers for their specific needs. Thus, customer access is distributed between all providers and intermediaries. In this case, both direct and indirect interactions between suppliers and consumers take place. Both suppliers and intermediaries are unable to establish their own ecosystems and create lock-in effects, with all surplus being transferred to the consumer. This more diverse market leads to increased competition and a lack of customer loyalty, decreasing the profits of intermediaries.

# ADDITIONAL DRIVERS WITH A HIGH IMPACT AND A HIGH DEGREE OF UNCERTAINTY

| | **Net Neutrality** | |
|---|---|---|
| **Net Neutrality is Given** | ← → | **Net Neutrality is not Given** |
| All data is treated equally by telco providers | | Certain data can be prioritized by telco providers |

| | **Internet Access** | |
|---|---|---|
| **Internet Access as a Right** | ← → | **Privatized Internet** |
| Internet is offered by governments as a basic right for free | | Internet is offered by private institutions |

| | **Differentiation in Business Models** | |
|---|---|---|
| **Specialization** | ← → | **Generalization** |
| Companies specialize in one part of the value chain | | Companies strive for a vertical diversification of the value chain |

| | **Sharing Economy** | |
|---|---|---|
| **Everything is Shared** | ← → | **Nothing is Shared** |
| Every product is shared between everyone | | Everything is bought and owned by one person |

| | **Social Acceptance of Technology** | |
|---|---|---|
| **Acceptance** | ← → | **Rejection** |
| Technology is fully accepted in the personal life | | Technology is rejected in the personal life |

| | **Customer Empowerment** | |
|---|---|---|
| **Empowered** | ← → | **Obeying** |
| Companies have to fulfill the expectations of the customers | | Customers have to accept products as offered |

| | **Hyperconnectivity** | |
|---|---|---|
| **Everything is Connected** | ← → | **Nothing is Connected** |
| Every person, machine, and device is digitally connected | | People and things are not digitally connected |

| | **Trust in Institutions** | |
|---|---|---|
| **Full Trust** | ← → | **Full Mistrust** |
| People fully trust public and private institutions | | People do not trust institutions |

| | **Monetization of Personal Data** | |
|---|---|---|
| **All Data can be Monetized** | ← → | **No Data is Monetized** |
| User data can be fully analyzed and sold | | No one is allowed to analyze or sell any user data |

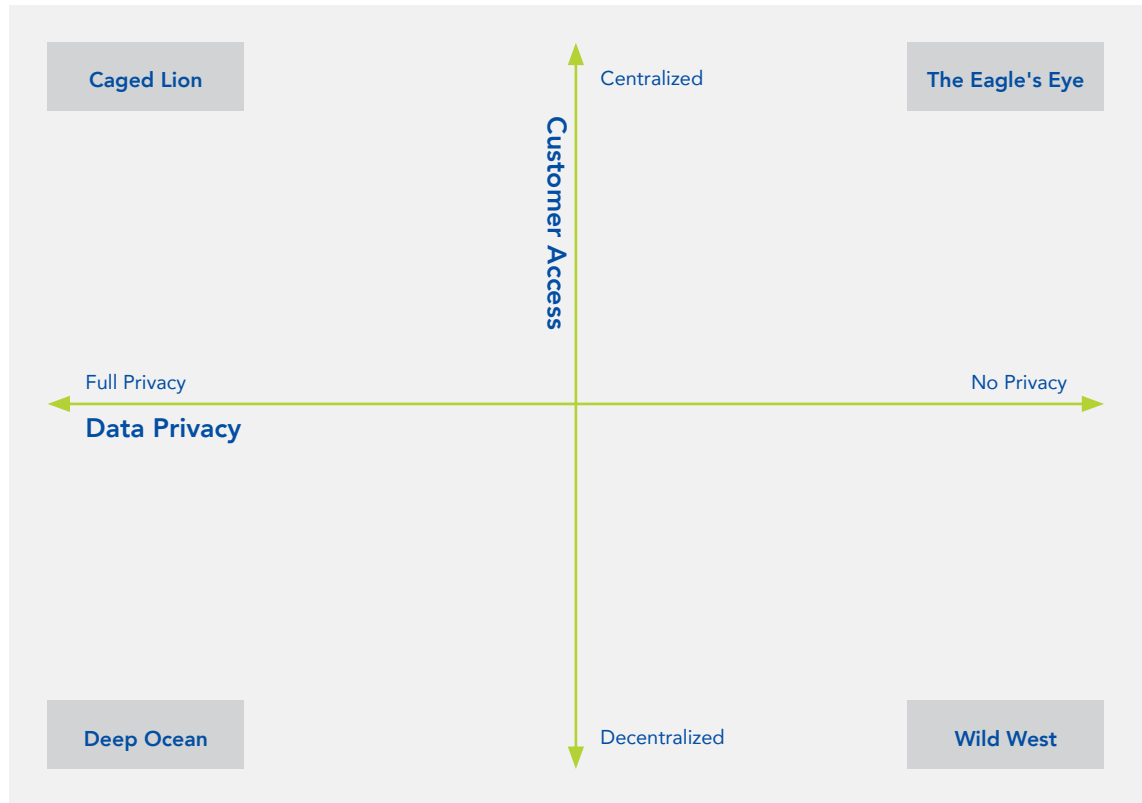| | **Smart Environment** | |
|---|---|---|
| **Only Personal Devices** | ← → | **No Personal Handheld Devices** |
| People need their own personal devices to digitally interact | | Surroundings provide interfaces for digital interactions |

# SCENARIO MATRIX

The two key drivers and their outcomes create the scenario matrix. Each key driver represents one of the axes, with the bipolar outcomes on both ends. All four scenarios are based on extreme outcomes of both key drivers. Plausible and consistent outcomes of other important drivers are included in each of the scenarios, but not taken to an extreme.

"The Eagle's Eye" describes a world where customer access is centralized in one platform and there is no data privacy. Telco providers thereby lose end-customer access and are focused on the B2B business. In the second scenario, "Caged Lion", all online interaction is channeled through one central platform, but are fully anonymized. Telco providers will be challenged to integrate into this unified ecosystem and interact with a customer that demands to remain unknown. "Deep Ocean" illustrates a world where full data privacy exists, however customer access is decentralized, which leads to various difficulties for telco providers in reaching the end-customer. In the last scenario, "Wild West", customer access is also decentralized, but data is not kept private, leading to highly personalized customer interaction in the telco sector.

| | Centralized | |
|---|---|---|
| **Caged Lion** | | **The Eagle's Eye** |
| Full Privacy | **Customer Access** | No Privacy |
| **Data Privacy** | | |
| **Deep Ocean** | Decentralized | **Wild West** |

# THE EAGLE'S EYE

## A day in 2037

Snow gently falls on deep brown leaves. Small icicles hang from the ashen trees and every now and then frozen drops silently hit the ground. A rapid panting and sound of crunching snow fill the air. 'He always loved the snow, he thinks and shivers. 'Philipp! You did it!' he hears the voice calling out proudly, 'you hit the five kilometers, your daily goal!' His steps become slower and heavier, the crunching snow slowly quietening. Philipp stands still, taking a last glimpse at the snowy fields. He wipes the sweat off his forehead and takes off his virtual reality (VR) glasses. The room is silent. The treadmill underneath his feet shows the number: five kilometers. A bit faster than usual, he thinks. 'Hey Oscar, how's the weather?'

'Wait, I'll show you, he familiar voice of Oscar, his virtual assistant, answers politely and symbols of clouds and rain appear on the translucent glass. 'It's 9 a.m. with a 70% probability for rain and 8 °C. Quite cold for a winter in Europe,' he thinks. 'By the way, Philipp, your daughter has an appointment for another flat share viewing at 11 a.m. and you're free this morning. You might want to join her?' he hears the voice of his virtual smart assistant again. 'Yes, Oscar, just schedule it for me,' Philipp replies. 'Oh and Philipp, as your daughter is moving out, you might want to reconsider your monthly data volume? I've already prepared the best possible offer. Do you want to hear it?'
'Maybe later,' Philipp mumbles.

Philipp turns on the water and feels its warmth on his body. 'I recommend using only 25 liters to stick with your current tariff, otherwise you will be upgraded...'

'I know, Oscar, just set a timer,' he sighs. Three minutes are over, the sputtering water slowly ceases and his hands search for a towel. 'Hey Philipp, just scheduled your viewing at 11 a.m. Do you want a background check for the potential flat mate of your daughter Olivia? It's only 2 CryptoCoins,' the voice chimes temptingly. The face of his daughter appears in his head, smiling about her university acceptance, 'Just go for it, Oscar,' he eases off. 'But wait, please wake Olivia up.' 'Already done that, I know your habits Philipp,' Oscar jeers and continues, 'so, the girl is called Michelle. Your daughter knows her through a common friend, Peter.' Oscar pauses, 'Michelle likes swimming and traveling, and she already had five serious relationships. Furthermore, OAnalytics matching score between Olivia and Michelle has reached 78%, so I recommend you to give it a try.' Philipp grumbles, 'Sounds interesting, Oscar.'

'Olivia! Olivia, we have to leave!' it rumbles through the apartment in the outer-Munich suburbs. Philipp stands there impatiently tapping his foot on the floor, thinking of the afternoon's upcoming meeting at UniTel, the telco company he works at. The problems they are facing due to the necessary partnership with Oscar are increasingly becoming overwhelming, he thinks. However, he is happy that at least this morning he gets a little break. 'She's coming,' Oscar says unimpressed, when the creaking of steps grows louder and a tall, blue-eyed girl appears rushing down the stairs. 'Dad, I'm sorry, I know you're stressed,' she mumbles. Silently they leave the house, as Philipp puts his finger on the door handle, carefully locking it with his thumb. A darkish blue driverless car with a round, white Oscar logo is already waiting. 'Drive us to Michelle, please!' Philipp orders and the engine starts to hum.

20 minutes later, they arrive in the city. A few rays of sunlight shine through the grey, dark clouds. A brown-haired girl opens the door and smiles, 'Hi Olivia, hi Philipp! You are Olivia's father, right? Oscar already told me about you. I'm Michelle, nice to finally meet you!' They walk up the stairs together and Michelle opens the apartment's door. Beams of sunlight reflect in the polished screens everywhere. A quiet whirring of little machines cleaning the floor can be heard. Olivia immediately taps her smart wristband and activates the AR-function to check how suitable her interior might be. Philipp can see his daughter smiling. She seems to like it a lot. After walking through the three rooms of the light apartment, Philipp's hunch is confirmed. 'I love it, dad, and Michelle and I know each other already. Is it okay with you?' Philipp looks in the expectant eyes of the two girls. 'Okay, I think it is actually a good idea,' he hears himself saying, '...and the neighborhood is also very good'. The two girls



squeal and hug each other happily. 'I have to tell mom immediately,' Olivia shouts excitedly, while pressing her fingers on her smart wristband. She raises her head with a grateful glance, 'Thank you, dad.'

Walking down the stairs, Olivia already fantasizes about her plans for her room. 'This is like starting a complete new life,' he hears Olivia cheering back in the blue Corolla from OCar sharing services. 'Embrace this new adventure,' he says and smiles back at her. 'Hey Philipp, as the traffic leaving the city is quite heavy, I'll drive you to work first,' Oscar interrupts and the engine starts again. 'By the way, I heard you are going to move out, Olivia? I have already thought about the perfect data plan for your new flat! You want to hear it?'

'Of course! Go on' she says excitedly. 'I have looked at your consumption in previous weeks and made a special offer just for you. With this OSpecial you can get 370 GB for just 27 CryptoCoins. What do you think?' Oscar suggests sprightly. Philipp wants to say something, but then just smiles at the hilariously low prices and decides to remain quiet. 'Of course, I take the option you made for me,' Olivia says delightedly. 'Dad, isn't it amazing how simple this is? So convenient,' he hears her cheering and sees how her mind wanders back to her new room, as advertisements for furniture and other interiors appear on the screen on the back of the front

seat. Thank God the new 7G network solved the problems with concurrent streaming and autonomous driving that have been occurring since the restrictions for net neutrality were lowered, he thinks.

Rain drums gently on the car's roof when Philipp opens the door in front of UniTel's central building. 'Bye darling, I'll see you for dinner,' he pauses, 'I mean, hopefully. Not yet sure, if I make it,' he says with a slightly sad tone and hesitantly closes the door. With his shoulders hanging, he walks over to the large entrance. In his mind, he goes through what he prepared to explain. He already imagines his boss, the angry face and the questions for the causes of the declining revenues.

Everyone is already there, all ten members of UniTel's board. 'Thank you, Mr. Merner, for joining us,' he hears one of the black suits saying in a deep tone. Philipp frantically takes a seat, already feeling Mr. Berg's harsh stare following him. 'We have just started discussing the voice inquiry we got from Oscar,' the black suit continues. 'They want us to lower our prices again. You know... at some point, they're just going to eat us up?' he hisses cynically. 'Our revenues are plummeting rapidly.' Mr. Leroy, the CFO, dressed in a dull grey suit and tie, adds worriedly, 'and our biggest competitor, CeTel, they're struggling as well, but apparently they made Oscar a better offer than we did.' Mr. Berg steps in again, 'We have to revise our offer then, I guess, Mr. Merner?' Philipp, startled by the sudden question, feels numbness in his hands and hesitates a second.

'Not yet,' he cautiously stammers, 'Oscar's sales manager also offered to cooperate on providing online streaming bundles. Could be a good opportunity to stabilize our revenues, I guess.' The men in the room look at him quietly. Philipp continues, 'I know, since we can't directly contact our customers anymore because of Oscar, things got harder. But still, we are the ones providing the infrastructure and its maintenance. And we're the experts. We should consider this offer.'
'I agree with Mr. Merner,' another man in a white shirt chips in, 'we are still valuable, as we have pushed very hard in innovating our network operations. Our annual report tells me, our new algorithms for predictive maintenance even saved us 50m CryptoCoins. I'm confident, we will find a solution for the pricing as well.' Mr. Berg mutters something incomprehensible and nods wearily, striking his hand over the smooth surface of his black suit.

The sky is almost black and thick raindrops splash against the windows, when Philipp raises his arm to call his daughter. He knows she's waiting at home, waiting to celebrate the new apartment with him. But he also knows he has to consider price negotiations for the new bundles now. We will celebrate tomorrow, he thinks and feels relieved, as a well-known voice interrupts his thoughts, 'Hey Philipp, Olivia is just listening to her favorite song on OMusic right now, would you mind calling her afterwards? I'll let you know, when the song is finished, alright?'

### Signposts:

- After increasing terror attacks in Europe, data privacy laws have been reduced and public surveillance covers 70% of the urban areas across the continent
- A rising technology company that offers internet related services and products wins the EU's antitrust case of its platform, allowing it to favor its own products on its search engines
- The platform partners with two major telco companies and cross-sells their products and contracts
- A major market consolidation in social media takes place, causing a merger of all social media services, in turn resulting in an increased market power of the technology company
- Numerous hackings of autonomous cars lead to major crashes. The governments take action by recording internet traffic and publishing the data on the government's website
- A global initiative for full transparency enforces the abolishment of all data protection laws
- The platform abolishes private mode on social media and all posts and interactions are publicly accessible
- The platform's personal smart assistant for their customer's everyday tasks dominates with an 80% market share
- Over 95% of all online sales are done through the platform and the platforms first offline stores are opened
- Customers demand highly personalized services and share publicly every byte of data to ensure that this happens

# CAGED LION

## A day in 2037

The smell of cheap coffee filled the room. The man looked around disinterestedly, trying to remember why he had gotten out of bed in the first place. 'Good morning, Simba.' The little display in the corner of his room lit up with the familiar logo and an electronic voice chimed, unsure of what to call him. 'You can call me Ben,' the man said. He felt like a Ben today. He liked to play with the fact that his virtual assistant couldn't store his data from one day to the next. He looked out the window and decided he did not like the appearance of those clouds. 'How's the weather looking later today, Simba?' he asked. 'Please provide location access,' the voice answered him. With a grunt, he slid the encryption key that hung around his wrist in the slot on his table, turning the small device into a pale hue of green. Ben held his finger against the key for a few seconds, granting him fast access to the information for the next couple of hours. He was slowly getting accustomed to the repetitiveness of the small task, the 'singular, specific permission' the politicians had all talked about for months. He certainly appreciated feeling of being in control of his own identity. 'Heavy showers are expected in the afternoon, better take an umbrella with you!' Simba informed him cheerfully. As his key changed to a bright red color, signaling that the system had been revoked its temporary access to Ben's data, he remembered why he had gotten up so early. 'Hey Simba, do me a favor and call me a ride, will you?'

'Certainly. Please provide location access.' He sipped the last dregs of his coffee and slid the key back in. He had promised his friend, Joe, to pay him a visit. Ben grabbed his coat and headed out the door as soon as the car was confirmed. Today's car was a black sedan, one of the newer models the car-sharing service had on offer. He settled into the front seat and proceeded to activate the panel on the dash where the steering wheel once was. 'Simba, pull up this week's The Observer.' The interface obeyed. Ben eyed the price for the issue skeptically. Two CryptoBucks were not exactly a fortune, but

it always irked him that he couldn't get the service for free like he once used to. The ban on data monetization had killed a lot of business models. 'Confirm transaction, Simba. Allow transfer of funds.' As the CryptoBucks were transferred from the local wallet on his encryption key to his phone, the front page appeared on his screen. 'Crime on the Rise: a Dossier,' the headline screamed at him. The article interested him. He

remembered dismantling of the state's surveillance apparatus fondly, but the ensuing wave of unchecked criminality made him reconsider. An advertisement silently popped up on his phone, attempting to sell him some lingerie brand's latest model of bra. He swiped it away absentmindedly and thought of reading the sports section. Fat drops of rain started to splash against the windshield.

The now pouring rain pattered hard against the glass door. Standing in the stairway, he felt grateful for having friends like Joe, who would pay for lunch every now and again. Ben was about to order a shared car back to his place when his phone informed him that his mobile data was almost up. 'What?' he spat. He could have sworn he had filled it up a couple of days ago. 'Simba, give me a list of mobile data providers,' Ben ordered. Simba obliged. 'Show me the cheapest offer for 7G data, with at least 5TB volume for 10 days.' Exasperated, Ben tapped the first option, the one with a vaguely familiar blue logo. 'Warning: the selected provider has been shown to have compatibility issues with the Simba platform and product family. I recommend an alternative plan in order to enjoy our full range of services.' A slightly more expensive offer next to a small red logo, popped up. Ben felt his brow furrow. Data was data and he needed his car now. 'Just give me the cheapest one, Simba. Confirm the transaction.' He held his encryption key up to his phone. 'Purchase confirmed, changing eSIM configuration...' As the transaction cleared, the small red icon on the corner of his screen faded to blue. Ben felt a small pang of concern. Maybe he should have done his research, he was pretty dependent on Simba nowadays. Then again, everybody he knew was too. He ordered a car to drive him home and his mind drifted off towards dinner. The rain continued.

Ben could not get into his apartment. There was a very large box in the way, flanked by a delivery robot that looked more like a forklift than anything else. He had almost forgotten he had bought a new fridge to replace his old model, a rickety thing from the 20s his landlord had dumped on him years ago. 'Uh can I-,' Ben began. 'Delivery for customer with smart



contract serial number 728362A. Please present your choice of zero-proof identification,' the metallic voice answered. 'Well, somebody watched Star Wars XXIII one too many times when programming you, buddy.'

'This unit has no biometric sensors due to Privacy and Net Neutrality Protection Act 2.3 paragraph F. Please present your choice of zero-proof identification.'

'Yeah, yeah,' Ben muttered as he slid his key across the small panel on the robot's side. The screen next to it turned green and the robot turned expectantly towards the door, waiting to be let in. After the delivery and basic installation, the delivery robot scampered out of the apartment and left Ben alone to do the network setup. He put his phone on the AR dock on the kitchen counter. 'Simba, please load the AR assistant for network setup,' Ben said. After a few seconds, Simba spoke in a calm voice. 'I am sorry, I'm afraid I cannot do that.'

Ben turned sharply towards the wall speaker from which Simba had spoken. 'What?'

'Your current data provider does not offer support for Simba AR and VR assistance.'
'You have got to be kidding me.' The little blue symbol ran through his mind, mocking him.

'The setting for my sarcasm and humor module is currently 'off'.'

'Simba, if I don't get this thing running, I have to actually go and order my stuff personally like some sort of savage.' Ben couldn't even remember the last time he had looked for something at the store instead of picking up a box with the order his fridge had made. 'The manufacturer offers a traditional manual. Should I show it on your phone?' Ben briefly thought of posting his woes online on Twitter, asking for help. Back in college he used to be an avid consumer of social media, before the different platforms had shut down due to security leaks or lack of users. The thought of asking in the anonymized Simba forums for help turned his mood. He sighed. 'Sure, Simba. Go ahead and do that.' The rain had not let up outside. It was going to be a long night.

Ben felt strange about letting other people in his apartment. After fumbling uselessly with the settings, Ben had called it quits and finally accepted Simba's offer of calling tech support. A man had then appeared first thing in the morning with a smile on his face and an uncomfortably enthusiastic handshake. His name was Holger, a paunchy man in his mid-thirties in a khaki uniform, soaked from the rain.
'The fix really is a breeze when you've done this a hundred times before,' Holger had explained. Ben was surprised by the fact that people still called personal tech support, let alone do it a hundred times for the same issue. Still, Holger's presence made him feel reassured, even when he had explained that he had to turn Simba off for some minutes to set up the network. 'Do you absolutely have to? I was going to ask Simba to brew us some coffee,' Ben offered. 'You know you can do that manually right?' Holger had asked. 'Uh sure,' he laughed nervously. 'Of course, man. Just joking.' Ben had not known that. As promised, Holger was done in minutes. The two men sat for a while and chatted. Ben started to understand why people kept calling other people to help them out with their tech problems. After what seemed like hours, Holger got up to leave, saying he had other appointments to attend to. 'Oh I almost forgot,' Holger said at the door. 'Can't leave you without Simba.' He punched some numbers in the wall panel next to the entrance, making it light up. Holger waved goodbye and closed the door. The familiar voice came back. 'Good morning.'

'Good morning, Simba. You can call me Mike.' He felt more like a Mike today. Mike smiled as he sipped his coffee. Outside, the sun was beginning to shine through the clouds.

### Signposts:

- Full privacy of personal data has become a common human value. People refuse to share any of their data online
- Strict data privacy laws for corporations and governments are enacted and enforced. Monetization and sharing of personal data is forbidden by law
- All personal data is encrypted and its access by services is only granted for a short-time following the permission of the user
- Users are only able to access internet services through one unified, single platform in control of one player. Advertising, online sales and customer relations are conducted solely through one single customer interface
- Customers access digital services through one single platform, which is regulated as an utility
- Marketing and services are no longer personalized due to the lack of personal data
- Charging fees for the usage of web services becomes the mainstream online business model as personal advertising is no longer possible
- Social media platforms transition into anonymous message boards and social interactions predominantly take taking place offline
- Telco providers can be easily and immediately changed through eSim technology
- Telco providers differentiate themselves mainly through price, offer variety and quality of integration into the single platform
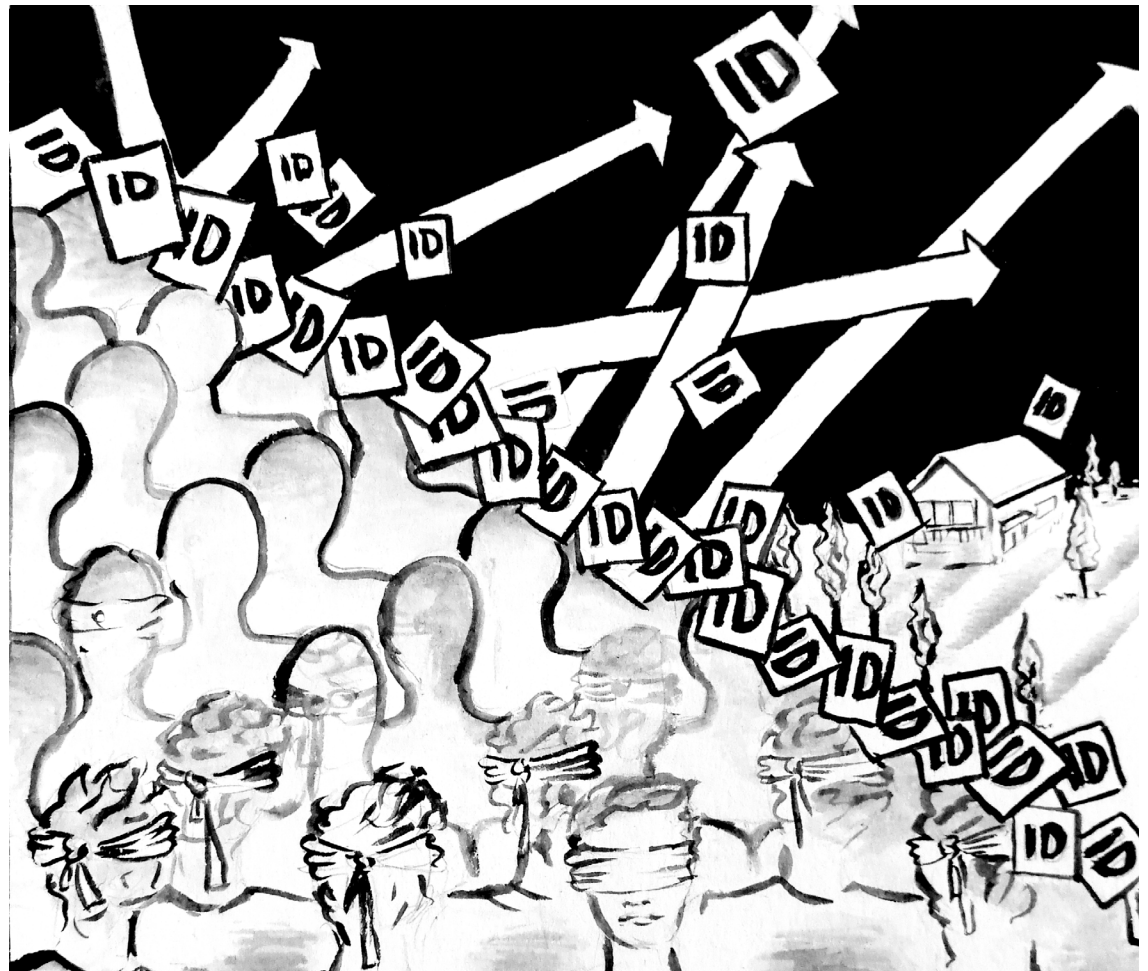
# DEEP OCEAN

## A day in 2037

It is early in the morning on the first day of spring 2037. The air is still fresh and clear. Through the dissolving mist, the first light rays are shining on the fields. The receding dew reflects bright golden light while trees cast long shadows on the house. A male person with the ID 371217-28 is watching this spectacle unfold from the warmth of his bed. Let's call him Karl. In a world of full privacy, all we know is that Karl was recently appointed CEO of a telco company, called SuperTel. His wife, we will call her Clara, is working as a school teacher.

Karl gets up as the sun rays gently play on his face. He puts on his smart clothes which regulate convective skin flow based on ambient temperature. With the subtle motion of his hand Karl instructs his assistant to prepare breakfast. The kitchen robot is starting his work. To see what has happened around the globe, Karl needs to set up his smart surface kitchen table by answering several questions until his preferred daily news selection is finally presented. He is impatiently going through this exact same procedure every morning, as no device is allowed to access prior personal data.

Karl books a limousine taking him to the office through one of the several car-sharing service providers who gained tremendous market shares. During the ride, his phone is connected to several high-speed glass fiber hotspots. Karl's wristband assistant reminds him of all the tasks of today. He has scheduled meetings with the marketing, sales and customer care departments to gain insights from all functions on the current state of business – a lot has changed in the telco sector. This is especially important for Karl, who is new to the industry, to evaluate the potential future strategy. Karl's workday starts with the marketing department meeting. He enters the room and asks for the results of the latest marketing campaign. The CMO is desperate, because he cannot deliver the required results. Privacy rules have made it increasingly difficult to target specific customer segments. Personalized ads are not possible anymore, so the company is forced to use a one-fits-all marketing approach. A marketing manager complains about the increasing complexity, 'In the current setup, multi-



ple new channels and intermediaries have evolved.' 'Should we focus on specialized shops and cluster customer access points? Then we could address specific customer groups adequately'. Karl ponders and comes up with a proposal, 'To increase the company's relevant channel-specific engagement we need agile teams.' By implementing this new approach, he is hoping to improve conversion rates, which dropped recently. This is caused by the newly introduced full privacy law which prohibits any kind of customer data access and analysis. To conclude, the CMO states, 'Currently, we are not able to control our marketing efforts and therefore cannot reach our core customer group individually. Nowadays, it is even more complex to initiate a marketing campaign with the increased number of involved stakeholders.'

Karl heads to the sales department, hoping for some positive news in the light of increased competition. He enters the department office and is baffled by the amount of people working there. The atmosphere is loud and hectic. The Chief Sales Officer (CSO), however, seems relaxed and greets Karl with a smile. Karl skips small talk and gets straight to it, 'How are things going in here?' 'Pretty good, actually!' the CSO replies. 'We have shifted our focus to B2B sales and even though we need a lot of manpower to accommodate all the channels, the negotiation power is totally in our hands. Intermediaries are desperately trying to gain market share, so we can squeeze out every last part of their commission.'

For lunch break, Karl arranged a meeting with a friend who used to be the Head of Customer Value Management. His department was closed three years ago, since the company was not able to contact current customers on an individual level due to the data privacy regulations. Since they have not discovered a new method to get in touch with their current customers yet, they both agree that cross- and upselling potentials have completely vanished. In addition to that, the lack of possible data monetization has severe implications on the business. Current net neutrality laws also make it impossible to prioritize traffic and differentiate offerings to various customer groups.

On his way back to the office, Karl's wife is calling, 'How are you doing?'. Exhausted, Karl answers, 'It's hard to get a proper understanding of the business and establish a new strategy. We're still identifying more and more problems especially due to the far-reaching data privacy regulations and increasing complexity'. To cheer him up, she says, 'Karl, you also have to see the other side of the coin – now all our personal data is protected, and we can't lose our identity to a company'. His wife, however, has had a rough day as well, and asks for his help in arranging a new phone contract, 'You won't imagine how long it took me to gain an overview of the available mobile contracts. The contract offerings I have gotten in shops are completely different to the ones which are available online. What is more, even online there is a huge variety of contracts which include different options. I just can't get my head around it!'. Besides SuperTel's offerings, Karl advises her to check the options from 'CoverageChamp' and 'AllYourDataHere', which offer top-notch coverage or unlimited data.

After lunch, Karl receives a notification on his smart lenses that the Head of Customer Care needs to update him on the current state of the department. The department's team informs him that they only have general statistics about complaints, but no information about contracts, services, and devices of the users who encountered these problems. Moreover, there is no data exchange between channels as they are disconnected. Since there are no unique identifiers, there is no way to map complaints to users from different channels to see whether recurring problems are reported. 'Our churn rates grow!' Karl mentions. 'No wonder, since we must delete all the data as soon as it's not needed for the interaction anymore, so we cannot predict if someone is leaving,' a customer care member replies. At the end, the same employee highlights the customer perspective, 'Customers have to explain the issues all over again if they use a different channel or the problem is still not resolved, since there is no protocol of recent activities'.

Karl takes a Hyperloop train home. 'Sweetheart, I've found one!' bursts Clara out as Karl enters the house. 'Nice, how did you do it?' asks Karl. 'I have paid 2.99 crypto-coins to use PriceComparison.com! They offer a proper overview of the different contract options, prices, providers and the cheapest channel.' says Clara. Since price comparison platforms cannot earn commissions anymore by referring customers, they charge for their service.

One thing Clara completely forgot though, was that she intends to keep her phone ID by transferring it to the new provider. As Karl hears this he thinks to himself, 'Oh gosh, not again. This has been a pain in the ass already the last time.' Karl reaches the customer service of Clara's old provider to initiate the phone ID transfer. 'Please enter your 10-digit authentication ID.' says a tinny, yet humanly sounding voice. After having looked up and entered his family contract au-

thentication ID, the ML enabled AI of the old telco provider vacates Clara's phone ID. 'Please enter your 10-digit authentication ID to finalize your enquiry.' says the voice again and instantaneously sends out the transaction code. When calling Clara's new provider, they encounter a similarly tinny sounding voice saying, 'For authentication, please enter your 10-digit auth…' Karl paused. He quickly realizes that the challenges which corporations face in terms of privacy and non-personalization indeed affect customer experience, too. To eventually transfer Clara's phone ID to the new provider, Karl has to enter his authentication ID a total of 5 times to consent to transferring data about contract, payment methods, and dates. Becoming increasingly annoyed about the process, he wonders, 'Is everyone really going through this? As a provider, we have to improve it.'

Clara and Karl, however, completely forgot about their home IT system. Since they moved in only recently for Karl to em-

brace his new position as CEO of SuperTel, they have not yet had time to install their home's smart box. It unifies all data in the home and connects it to the outer world. Compared to the phone ID transfer, Karl loftily says, 'That's going to be like stealing candy from a baby!' Since society's acceptance of technology has risen dramatically, AR has made its way into public and Karl's contact lenses apply it in everyday life. After entering his personal authentication ID, the instruction manual for his smart box is sent to his contact lenses. A step-by-step guide shows him exactly which screw to tighten and which hatch to close. Within only 20 minutes their home IT system is up and running. After all, both work and private life took a huge leap forward compared to the past. Especially considering that arranging an appointment with a technician could have undoubtedly taken 6 weeks in the past. Tomorrow he is going to be at work again with a clear mind – to then deal with corporate telco challenges once again.
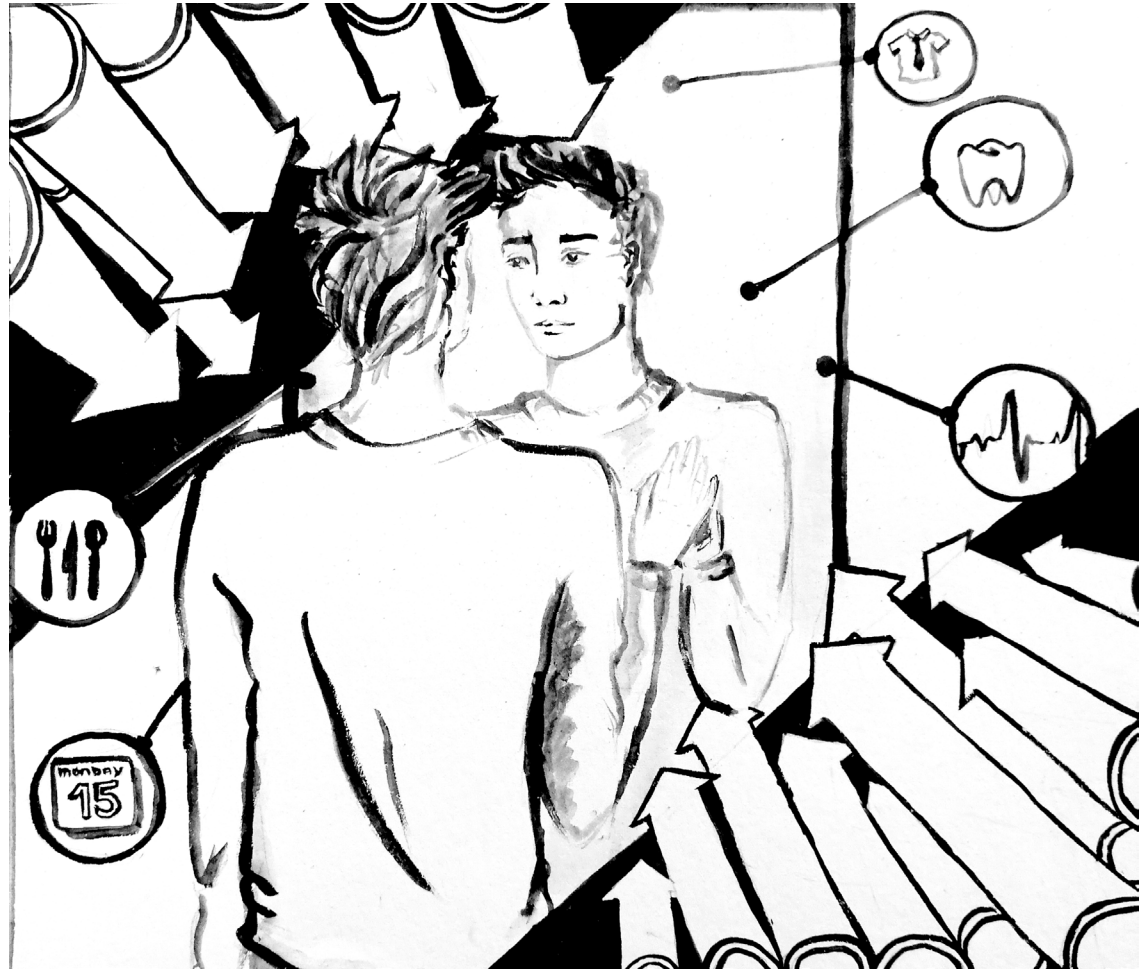


## Signposts:

- In the last year, 10 new social networks gained popularity, companies fail to catch up on providing customer care across rapidly emerging channels
- Your Data Party (YDP) wins German election by a landslide
- End of the ongoing discussion on the trade-off between privacy and convenience, governments forbid any sort of data access and analysis
- Every company is forced to shut down their data analytics as the new full privacy law is rolled out
- 87% of German citizens feel relieved knowing their data is save
- Number of personal assistants reaches an all-time high, but the lack of personalization leads to unsatisfying user experience
- End of the freemium model - last free price comparison site shuts its doors
- Have data privacy laws slowed innovation? 80% of internet companies invest less in research and development than 5 years ago

# WILD WEST

## A day in 2037

It is a calm autumn morning in the city center of Berlin. All of a sudden, the silence is disrupted by an intrusive alarm. Jacob slowly opens his eyes and mumbles, 'Alright, I'm up. Alarm off, please.' The sound of the clock diminishes. After stretching in bed for a couple moments, Jacob gets out of bed. Still feeling tired, he tumbles into his bathroom where the mirror greets him straight away, 'Good morning, Jacob. You look good today! I checked your dental records and recommend flossing today. I have already ordered your breakfast according to your nutrition plan and it will be delivered in 15 minutes.' Jacob nods uninterestedly and takes his toothbrush out of the cabinet. Just as he applies the toothpaste, his mirror shows him several personalized advertisements promoting dental floss products. Being overwhelmed by the variety, Jacob simply continues with brushing his teeth until after a couple of minutes the mirror tells him to stop. He inserts his smart lenses, where a notification immediately pops up in his vision field informing him that breakfast is ready. Just as he enters the living room, a drone elegantly lands on his lunch table and drops a box containing his breakfast. As he sits down to start eating, he wonders what his 7-year old daughter Nina is doing. Jacob gently taps on the table and a search field opens. 'What is Nina up to today?' A data exchange service pops up and displays a summary about all her calendar entries and recent online activities. 'Oh, she has an exam today. I should wish her good luck,' he thinks and uses the interface on his table to call Nina. Multiple offers with different services ranging from voice calls to virtual re-

ality meetings emerge on the screen. He notices a sentence below the offers saying, 'Every quotation is personalized exactly for your needs, Jacob. We calculated these in real-time based on your wish to call Nina.' Jacob pauses eating and chooses to have a virtual reality meeting in order to see his daughter in person. Thereupon the room turns black and a display of Nina appears.

Their conversation is interrupted by a warning in his field of vision reminding him to leave soon. 'Nina, darling, I have to leave now to catch my flight. Have a lovely day my dear and good luck with your exam,' Jacob says before swiftly walking to the wardrobe in his bedroom. He packs his bags and heads out of his apartment. Several autonomous cabs are already waiting for him downstairs. He chooses the cheapest

one, places his suitcase in the trunk, and jumps into the car. 'Good morning Jacob, we are happy that you have chosen CheaperCap again. I just want to let you know that you are not flying to Paris today, but instead your project partner requested to meet you in Barcelona. Your flight has already been rebooked. Do you want to rent out your apartment for the next two days again? I have three platforms for you where you can earn between 90 to 145 CryptoCoins for it.'

'Thank you for the update. Yes, post my apartment on the same platform as the last time and inform me if somebody is interested. And please show me the news and the latest episode of Game of Drones afterwards,' Jacob responds.

'Here is an update about the data stock prices. Your streaming service has no speed package with our connectivity provider. Watching in Ultra Definition and without advertisements costs one CryptoCoin today.' Jacob agrees and falls back into the seat. The car arrives at the plane right when the episode ends. As he enters the plane, Jacob is welcomed by the virtual assistant shown on his lenses, 'Hello, Jacob. Please follow me to your seat. It is all set up to your preferences. I wish you a pleasant flight.'

Right after the plane has taken off to Barcelona, an advertisement pops up in the right upper corner of Jacob's visual field, 'Hello Jacob. I found a cheaper provider for your business trip to Barcelona. I can offer you a perfectly tailored telecommunication package for the duration of your business trip. Furthermore, I can provide you with unlimited internet access for the duration of your flight for just two CryptoCoins. Blink twice now to accept it. I wish you a pleasant flight and a good





stay in Barcelona!' Having accepted the offer Jacob starts reading a news article about the corruption scandal in the Spanish government, which was revealed by a citizen who detected inconsistencies in some of the politicians' statements of account. Since the affair caused nationwide rumors in the last weeks, the totalitarian government is strongly committed to cover it up.

After arriving at the airport, Jacob walks straight to the autonomous-car station while nostalgically recalling his childhood memories about the endless queues at the security checks and custom controls. Whilst continuing to read the news article, an error message starts blinking in his lenses, 'Sorry Jacob, this article is marked as illegal content and not available in Spain. Is there anything else you would like to read in the political column or would you like to proceed with the sports news?' Jacob continues with an item about last night's semifinals of the e-sports world championship. Meanwhile, he has arrived at the mobility station, where he faces ten cars with open doors obtruding him. He randomly enters one and without further action, the car drives off. Abruptly, a female voice welcomes him from the car's speakers, 'Hello Jacob, you forgot your electric toothbrush. Analyzing our medical data, I strongly recommend buying one. Select one

from the following twenty offers and your brush will be delivered in the evening.' After a short drive, Jacob arrives at his apartment for the nights and prepares for the upcoming meeting. As he logs into the intranet of his company, he realizes that some of the content might be confidential. Even though he does not fully trust the provider's specification, ever since providers can use and sell the data they transfer, Jacob books an hour of secure internet due to his company's policy.

Being preoccupied with his preparations, Jacob's smart assistant reminds him of his busy schedule, 'Hello Jacob, you know your boss Mrs. Taylor is kind of a strict person and has

already given a mediocre assessment about you. Thus, in order to avoid further points of criticism I have already called you a car so that you will arrive in time. As there is no traffic in the smart city of Barcelona, you have enough time to change your clothes since heavy rain is expected. Surely, Mrs. Taylor will lower your performance score if you entered the meeting with a wet suit. I wish you good luck!'

After the meeting, Jacob subtly perceives an emerging feeling of hunger and thus opens his favorite self-optimization app. In order to obtain all the nutrients he has a lack of, Jacob is suggested to go for a veggie curry for which a special discount is offered. Because he is a bit tired, Jacob orders

delivery and when he arrives back at his apartment the food is already waiting for him. He turns to the big window and with a single click the window turns into a large screen. He selects a movie that is recommended to be best according to to his current mood and enjoys his meal on the couch. Both the food and the movie exactly fit his taste. After a little rest, Jacob decides to play an e-sports game. He joins a match and plays for a little bit, but gets annoyed about the latencies shortly after. Rent in the apartment only includes a basic 7G connection. Once again, 7G does not meet the expectations for real-time gaming, so he decides to switch to the fiber-optic connection instead. He books it at a provider that was suggested to him by another gaming friend without comparing all the different offers. After an intense start, his Chinese friend texts Jacob that he is about to join the game. An error message appears, 'If you would like to participate in international gaming sessions, please book the international package.' To be able to play with his friend, Jacob has to change the provider again, because his current one does not offer international gaming. He gets annoyed about all the hassles with the provider changes and leaves the game. He puts his remaining gaming time up for sale, which is bought by another gamer shortly after. During the game, his mother called but did not reach him. He realizes that she has called him in privacy mode and books a privacy package to return the call and block all advertisements for that duration.

'Hey, I've been at the doc and have the results of my medical examination,' his mother starts.

### Signposts:

- The last state-owned company is privatized
- Law prohibits one company to have more than 30% of the market share
- Dynamic pricing model based on real time network utilization is introduced
- Chatbots are operating more call centers than humans are
- International abolishment of national data regulation and protection laws to ensure free data transfer
- Pay-with-data Business Models are increasing
- Privacy-as-a-Service business models arise and make up 50% of telco providers' revenues
- First Stock Exchange trading personal data opens
- Predictive purchases made by computers for consumers are allowed
- Predictive law enforcement allowed to ensure public security

# IDEATION

The following chapter describes five novel business models in the field. Each of the business models is described using the Osterwalder Business Model Canvas.
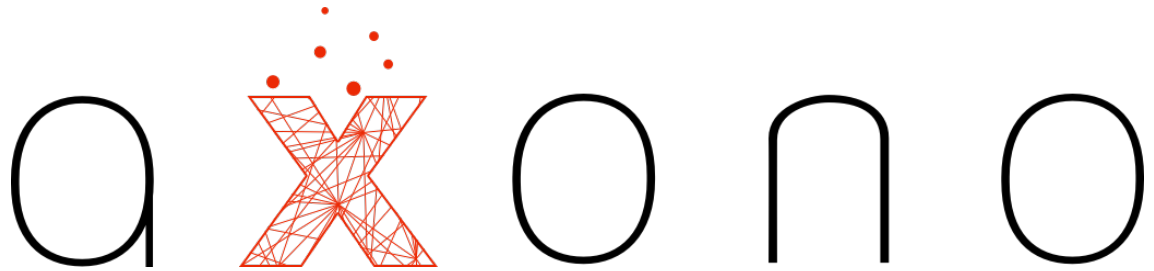
# AXONO

**A Mesh Network Bridging Connectivity
Gaps through Device-to-Device
Communication**

Axono is a mesh network that provides connectivity to more people at more places. Just like the axon of the human neuron, it is a multi-channel and increases the speed and stability of data transfer. Axono connects any device through several channels without central coordination. It uses the mobile and broadband infrastructure as well as different technologies such as 4G LTE, WiFi, and Bluetooth LE to create one closed meshed network. It is designed as an add-on to the existing broadband and mobile network.

This results in better connectivity in remote areas and greater network quality in densely populated areas. Each device that runs the axono software empowers the decentralized network. To have a dense and extensive mesh network, a great number of devices has to be connected. This can be achieved through partnerships with device manufacturers. To

ensure that data always takes the fastest route to its destination, axono provides efficient routing protocols. In addition to quick routing, axono is also capable of providing anonymity for honest users, while still offering traceability of legal infringements.

The main benefit for customers reaching from businesses to end-customers is increased connectivity. Additionally, axono enables a new generation of applications, such as Peer-to-Peer messaging and Car-to-Car communication. This reinforces the existing infrastructure, relieving its existing burden.

To enable the development of new applications, axono offers an SDK. Software developers can tailor their applications to the mesh infrastructure and create new business models on top of axono. As soon as these applications have reached a

critical mass, axono will charge for the use of the SDK. This creates a new revenue stream besides the subscription fees paid by its end-customers.

With an exponentially increasing amount of connected IoT devices across various industries (e.g. smart city, connected cars, smart home) the mesh network will increase its value. Simultaneously, telco operators can reduce their infrastructure costs, since most of the data transfer is handled by the devices of the mesh network. Axono is the next step to a smarter and more connected world.

**Business Model**

## Value Proposition

Axono is a mesh network with the goal to improve the co-mAxono is a mesh network with the goal to improve the communication infrastructure. The core value propositions are the increase in mobile data coverage, higher network stability, and the possibility of enabling smart device communication.

**Mobile Data Coverage:** Coverage of mobile networks is almost without connectivity gaps in metropolitan areas. This is different in rural areas, due to slow and unreliable connectivity. A mesh network can bridge connectivity gaps and increase network coverage. For example, customers in rural areas with poor connectivity can connect through a variety of devices to reach the internet access point. Urban areas with network congestions, e.g. public transportation or sealed buildings, can also benefit from a mesh network. The network delivers mobile coverage to low connectivity areas all over the city. Within this proposition, the value lies in an improved connectivity and therefore a higher customer satisfaction.

**Network Stability:** Natural disasters, technical failures or even a high amount of network traffic can lead to network outages. This is a worst-case scenario for telco providers and their customers, who are dependent on their service. Network stability increases with the ability of a mesh network to simultaneously transfer data between interconnected devices. The most important use case in these terms is to solve network capacity problems by providing a different channel. During crowded events, when the network is congested, the mesh network releases the existing infrastructure at low cost. Complications will not affect the overall service in the same extent compared to a network without axono. This leads to higher levels of customer satisfaction and loyalty.

**Smart Device Communication:** For customers, a mesh network generates value by enabling a new generation of applications. Axono can interconnect devices in industries such as connected cars, smart cities and homes easily. Therefore, applications built on this ability such as Peer-to-Peer messaging, Car-to-Car communication, and traffic monitoring are possible. This interconnection also enables real-time insights and network monitoring. For example, the interconnection of cars enables smart monitoring of the traffic system within a city. In conclusion, many businesses will benefit from integrating their applications into a mesh network.

## Customer Relationships

**Seamless Integration:** As a first step, current customers of affiliated telco providers will automatically turn into users of the mesh network via an update of the provider's app on their devices. Telco companies will slightly change their products due to the mesh network. Customers will not only be one end of the data cycle, but turn into transmitters. Because axono will reduce the amount and density of traditional connectivity stations, customers who are not part of the mesh network will experience a decrease of quality service over time. By utilizing the existing customer base, large telco providers can instantly reach the critical mass of users. At first, Android smartphones will be part of the network, since Apple restrict apps to change fundamental services of the system [436]. By the time the eSIM technology is further developed, axono plans to use this easy access to allow devices which do not have the app installed to become part of the mesh network. By adjusting the eSIM protocol, all customers of the affiliated telco partner can now be instantly turned into mesh network users and use its full potential. As the last step, axono is going to update the current hardware and routers to offer an even better network quality and to relieve mobile devices utilization.

**Developer Support for SDK:** Axono offers an SDK for developers to use the full potential of the mesh network. Third party applications will be an important differentiator to the traditional network. Therefore, supporting the development is important, since these applicationsy are going to be beneficial for the network.



**Customer Acquisition:** Building traditional infrastructure to connect every person and region with the same speed and reliability has always been considered too expensive for one provider. Axono will offer the people the same quality as people in the city. However, the mesh network requires a critical number of devices being part of the network in certain areas to run effectively. Winning sufficient customers in each area will be crucial for the technology. Targeting the first few customers in each remote area requires a lot of marketing efforts. Additionally, axono needs to win these new potential customers partially from competitors, which already offer connectivity in remote areas.

## Channels

To deliver axono's value proposition to the user, it must be visibly communicated, sold, and distributed to its four different customer segments.

**Emotional Targeting of End-Customers:** For end-customers in rural as well as urban areas, connectivity in situations of lacking or congested infrastructure, outages or natural disasters is axono's key value proposition. This must be clearly communicated to the end-customer. This means, that axono must engage in intense and emotional media campaigns to communicate the value to the customer. This is important for the acquisition of new customers and lowering churn rates. Communication channels should include stores, web- and mobile applications, and third parties promoting the product through their channels.

**Selling and Distributing to the End-Customer:** For end-customers, access to axono's mesh network is provided by regular mobile network contracts. Axono can then handle sales through conventional mobile network providers' online and offline sales channels. These include stores, websites, and mobile applications. Private customers will need to download an application on their mobile device in order to get access to the network.

**Technical Targeting of Businesses and Developers:** It is important to also reach the two equally important customer groups of businesses and mesh application developers. Axono can reach further awareness through technical tradeshows, conferences, and business-to-business marketing initiatives, such as direct mailing and trade fair campaigns.

**Selling and Distributing to Businesses and Developers:** In Contrast, axono must target its two categories of business customers, including corporations with an interest in IIoT and mesh application developers, differently. Sales to business customers are handled by account managers through either customer contracts and quotations. In contrast to business customers, axono targets and supports mesh application developers through an online platform for developers. SDK, technical documentation, community forum for developers, and direct customer support are available on this platform. Axono can also leverage its sales through this channel.

## Key Resources

Key Resources of axono are the network infrastructure, access to a large customer base, and financial resources gained through affiliations with telco providers.

**Expertise in Communication Networks:** One of telco providers' core assets is their broadband and mobile cellular network. The knowledge regarding maintaining and further developing communication networks is already their core knowledge. For long range communication, axono will be dependent on this network. The existing network is a special asset during the market entry of axono.

**Access to Large Customer Base:** Telco providers hold an immense customer base. With this reach, axono could easily reach a critical mass of end-customers. By connecting multiple devices with each end-customer to the mesh network, this can boost the market entry of axono.

**Partner Network:** Besides end-customers, telco operators already established relationships with business customers and partners. B2B relationships are very hard to establish for startups, because it is very difficult to identify the right contact person at big corporations. Even if this succeeds, it comes at the cost of valuable time due to the very slow processes of big corporations. Telco operator's partner networks expand across a variety of industry verticals, such as relevant automotive manufacturers and IoT manufacturers. Axono can accelerate the distribution of its SDK within this existing partner network.

**Secured Financial Basis:** One of the main activities for startups is to acquire new capital, since the revenues are very little and costs keep occurring. The biggest proportion of axono's expenses are caused by software development. Through the affiliation with a telco provider, axono will rely on a healthy and solid financial foundation. In addition to that, axono will be able to focus its resources on the core business and key activities.

## Key Activities

There are three key areas on which axono will focus its activities: the development of the software, its distribution among device manufacturers and the support of its partners.

**Development of Software and SDK:** As software will be the core asset of the business model, it is crucial to develop the end-to-end axono software. The basic software consists of different layers and will run on every device. The software can connect different devices to one mesh network, which distributes and sends data in a quick and efficient way. The creation of a smart switching protocol for the routing between the cellular network and the mesh network is especially important. Here, telco operators are great partners, since they are very familiar with communication networks and protocols. Third parties will be enabled to develop additional applications on top of the software through the SDK.

**Distribution of Software Among Device Manufacturers:** Device manufacturers must include the axono software into their devices so axono can create a dense and extensive mesh network. Device manufacturers can also benefit from the axono SDK to create their own applications on top of axono. As soon as axono established itself among a critical mass of devices, it will be able to create network effects. This is the reason why axono will give special attention to its partner network.

**Technical Support for Key Partners:** After the distribution of the software, the main task is going to be the technical support of key partners. This includes an appropriate onboarding of the partners, as well as an ongoing support and further development of the software. Especially IoT device manufacturers might request trainings to properly integrate the new software into their devices. In case they want to build their own applications on top of the axono SDK, they will also receive adequate support by axono. This is essential to guarantee a long-lasting success of manufacturing partners.

## Revenue Streams

The revenue streams of axono are based on new contracts, third party applications, reducing infrastructure costs, and support of businesses.

**New Contracts:** Axono improves the mobile network in respect to quality and stability. This attracts several customers, providing connectivity contracts as the main revenue stream. Next to the existing customer base of a telco partner, axono also attracts customers to sign a new contract. These include for example niche segments, such as people from the countryside or customers attracted by large events and festivals.

**Third Party Applications:** To attract as many developers as possible, a fee should be avoided in the early phase. As the network becomes more mature, developers or large applications can be charged for using the SDK. This fee can be based on the revenue of the application or from a fixed fee for developers.

**Reducing Infrastructure Costs:** Axono has the potential to significantly reduce the high fixed operating costs of the telco industry. This mostly affects the telco infrastructure in densely populated areas, as costs are reduced by outsourcing the infrastructure to other devices. For example, more communication is processed through the mesh network without connecting to the internet and through fiber cables instead of LTE. For telco providers, the fixed costs are reduced. For example, a relief in infrastructure (such as antennas and hubs) reduces the number of places to rent and the maintenance costs of the hardware.

**Support of Businesses:** Especially SMEs might need help with the initial setup of the software and on how to use the SDK for the development of their own applications. Axono can charge these business customers for setup, support, and consultancy.

## Key Partners

There are two key partner categories for axono: those who are necessary to develop and distribute the axono mesh SDK and those who regulate telecommunication.

**Device Manufactures:** Router, IoT device, and smartphone manufactures are a cornerstone of axono's partner network. The main task for these partners is to distribute it to their own devices. The crucial goal is to distribute the software to increase the number of devices in the mesh network exponentially. Thus, the mesh network gains a critical mass of devices in a heartbeat. An easy and fast implementation increases the value for axono customers even further.

**Regulators:** Regulators have the power to shape the whole telco industry. For axono this plays an important role in terms of potential subventions by the government. Between 2016 and 2018, the government plans to invest 2.7bn EUR for faster internet connections [435]. As a mesh network is capable of reducing the pressure on expensive infrastructure investments and connecting remote areas, it will be positively affected by government funds. Also, a mesh network is a potential target of laws and regulations. Since the mesh network turns the communication infrastructure into a decentralized network, regulators want to take part in these changes and will impact axono.

## Customer Segments

Axono targets all users of smartphones, IoT devices, and any other object that is connected to the internet via mobile or broadband, creating a potential market of 132m devices to connect only in German [437]. In this large market, there are highly differentiated customer groups. These can be clustered into end-customers in urban and rural areas, and mesh application developers.

**End-Customers in Rural Areas:** Axono's mesh network enables connectivity where infrastructure is lacking or previously failed. In many rural areas, full coverage is still lacking due to high costs of infrastructure extension and maintenance. Therefore, axono especially targets customers living in these rural areas.

**End-Customers in Urban Areas:** Network congestions, crowds, and sealed areas, such as subways, interfere with the local infrastructure and frequently prevent a reliable and fast connection of end customers. Thus, axono is interesting for any urban citizen demanding for fast and reliable connectivity.

**Businesses with Internal Networks:** A mesh network enables businesses to enhance and simplify their internal network structure, as they can interconnect all their devices using axono's SDK. Through integrating the mesh network, businesses can benefit from risk reduction for outages due to device-to-device communication. These assets might simplify the digitization for SME's and corporations and enhance workflow efficiency.

**Mesh Application Developer:** Axono enables developers to run their applications on the mesh network's SDK. These developers can create their applications based on and for the mesh infrastructure to establish device-to-device communication. An existing example is Firechat, which is a messenger app enabled by a mesh network. For developers to be able to utilize the benefits of the mesh network, they need to implement the axono software in their applications and thus become an additional customer group.

## Cost Structure

The cost structure of axono can be separated into three different sectors: the software development costs, the cost for further development and support, and the cost for the customer acquisition. Since a telco provider is an essential partner, their cost structure will also change. Although the business model is scalable, the integration of new regions all over the world requires large investments in infrastructure and support of local partners.

**Initial Development Costs:** The development of the mesh algorithm and dynamic routing protocol requires a large development budget. As security and encryption are crucial, the initial development must be checked and verified several times which leads to higher costs for the development. To enable external developers to use the mesh network, it is also required to invest upfront in good external Application Programming Interface (API) access.

**Support and Further Development Costs:** As for all software projects, the SDK needs to be updated and bugs must be fixed, which makes permanent development necessary. It is important to employ several developers which add new features to the SDK and solve existing problems. Especially from B2B partners a large request for support is expected. Thus, capacities for supporters and IT-specialists are needed.

**Customer Acquisition Cost:** It is especially important to acquire customers in remote areas in the early stage. To reach this goal, several expensive marketing initiatives are needed. It is also important to find B2B customers and developers who build their own applications based on the SDK.

## Scenario Fit:

**The Eagle's Eye:** Through the decentralized character of a mesh network, it is more difficult to gather personal data compared to cellular networks. This has little consequences in a scenario where privacy regulations are abolished, as for example a recurrence of applications providing data privacy to end-customers. However, the mesh network does not completely restrict data collection and therefore still potentially generates insights for the centralized platform. Due to the centralized customer access, partnerships between axono and telco providers do not support telco providers in gaining visibility to the customer. As axono delivers improved connectivity and enables third party applications on the mesh network, it has the potential to enhance network quality of affiliated telco providers. This improved network quality can serve affiliated telco providers as a differentiation criterion, which puts them in a powerful position in negotiations with the central customer access platform. Therefore, axono's business model fits very well into "The Eagle's Eye" Scenario.
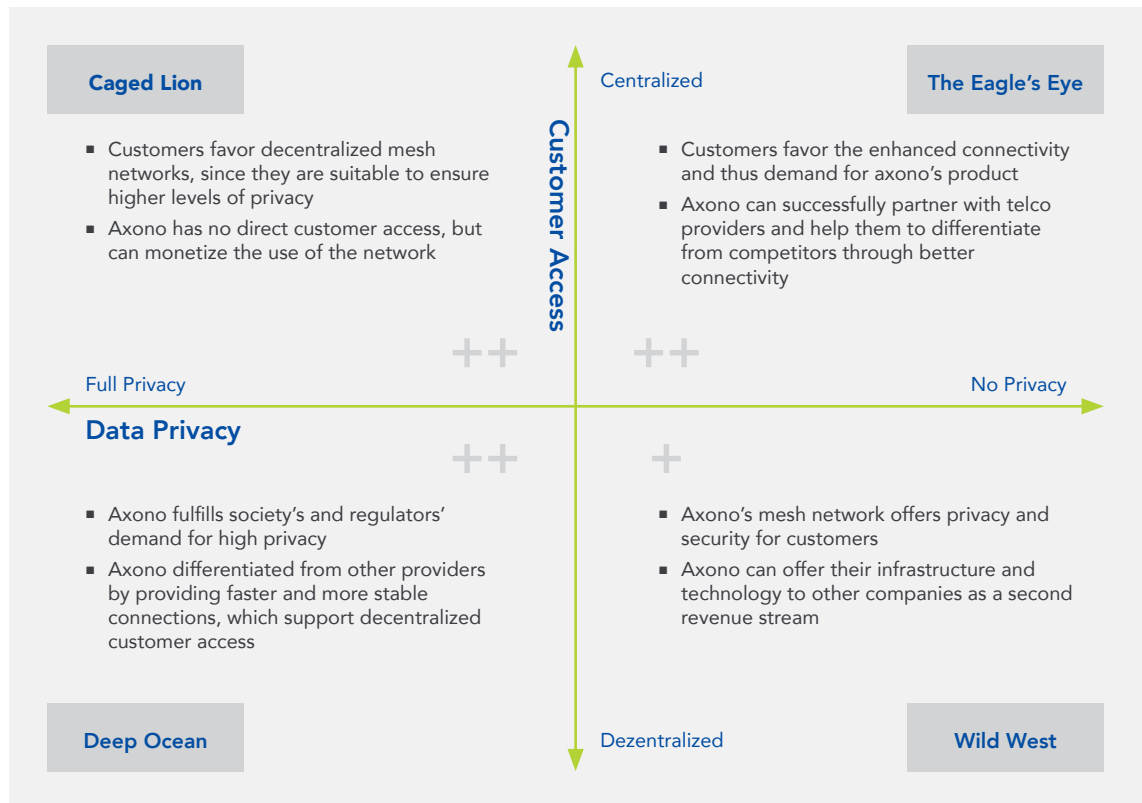


**Caged Lion**: In a world with centralized customer access and where full privacy is established, axono can be the network of choice. The specification that a mesh network is totally decentralized and therefore no data is saved on central servers fulfils the needs of society perfectly. Enabled by encryption, axono can rise to considerable importance within the scenario. Centralized customer access only allows the system to run in the background. This results in indirect customer interaction which restricts the possibility to strengthen the provider's brand. Nevertheless, a huge number of applications could be still executed through axono. Axono is able to monetize the use of the network and also profits from the indirect customer interaction. Therefore, the business model fits well into the scenario of the "Caged Lion".

**Deep Ocean:** In a scenario where full privacy is demanded, network connections must be encrypted and protected. The introduction of a mesh network perfectly supports high control and enables full privacy. For this, axono perfectly fulfils the needs and requirements of regulators and society. Because of the absence of a central intermediate, axono can support small and medium enterprises with their business by enabling decentral communication. The network is also an enabler for developing other decentralized applications and services, which fits in this society.

The lack of a central intermediate and the existence of many IoT devices also profits a lot from the mesh network, which can connect devices from different providers. For axono, this is a strong differentiation criterion, which might establish itself as a central platform in the background. Thus, axono perfectly fits in the scenario of "Deep Ocean".

**Caged Lion**

- Customers favor decentralized mesh networks, since they are suitable to ensure higher levels of privacy
- Axono has no direct customer access, but can monetize the use of the network

++

**Centralized**

**The Eagle's Eye**

- Customers favor the enhanced connectivity and thus demand for axono's product
- Axono can successfully partner with telco providers and help them to differentiate from competitors through better connectivity

++

**Customer Access**

**Full Privacy**

**No Privacy**

**Data Privacy**

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- Axono fulfills society's and regulators' demand for high privacy
- Axono differentiated from other providers by providing faster and more stable connections, which support decentralized customer access

+

- Axono's mesh network offers privacy and security for customers
- Axono can offer their infrastructure and technology to other companies as a second revenue stream

**Deep Ocean**

**Dezentralized**

**Wild West**

**Wild West:** In a decentralized world, several companies have to fight for the customer access. The decentralized network fits this scenario. There will be many providers targeting different geographic areas and customer segments. Many providers will struggle to acquire the critical number of devices to set up their own mesh network or might not even have the intention to build up their own network. Axono would offer their infrastructure and technology to those companies to increase their infrastructure quality, while still selling to end-customers directly. In a world without any privacy regulations, axono's decentralized network can offer privacy for customers still demanding it. Depending on the configuration of the mesh network, it can also enable companies to gather all the data from users, since user data is publicly transferred via many devices.

## Challenges:

- Reach the critical mass: Initial growth of the network is essential, since mesh networks need to reach a critical mass of devices to unleash their full potential
- Acceptance by customers: customers have to be incentivized to share bandwidth on their devices for the cost of battery power
- Acceptance of key partners: In order to reach a critical mass of devices in the network hardware manufacturers need to be willing to implement the axono SDK in their devices
- Development of applications: third party application developers have to see use cases for applications build on a mesh network
- Threat of Competition: Differentiation to existing competition is necessary to become the main mesh network provider
- Regulatory insecurity: Regulation of mesh networks or even the declaration as a commodity are a threat to the business model

## Outlook:

A successfully implemented mesh network allows new applications and services on top of the infrastructure, exploiting the technology's value proposition.

**Peer-to-Peer:** In messaging apps, there is no need for a central server anymore. A message will be sent from one device via several other devices until it reaches the target device. This allows data transfers in closed and remote networks that have no connection to the outside world, like in an airplane, after major catastrophes, or during a festival where the network just collapses. Developers need to adjust their applications and providers need to decentralize the existing infrastructure.

**Automated Cars:** Telco providers claimed connected cars require an abolishment of net neutrality, whereas car manufacturers say, 100% connectivity cannot be guaranteed and therefore the car drives on its own. The mesh technology enables cars to exchange information with the cars around it and will not rely on internet connection or a central server.

**Local Ads:** The information in a mesh network can only travel a certain distance from device to device. This enables more locally based advertisement. An ad can now be sent from a shop and only reaches the devices around. It would not go further than a defined number of devices and stay in one area. These ads would appear as normal ads on websites users visit or apps they use. This would even work in a world where with very strict privacy regulations, because the source of the advertisement does not know the destination devices.
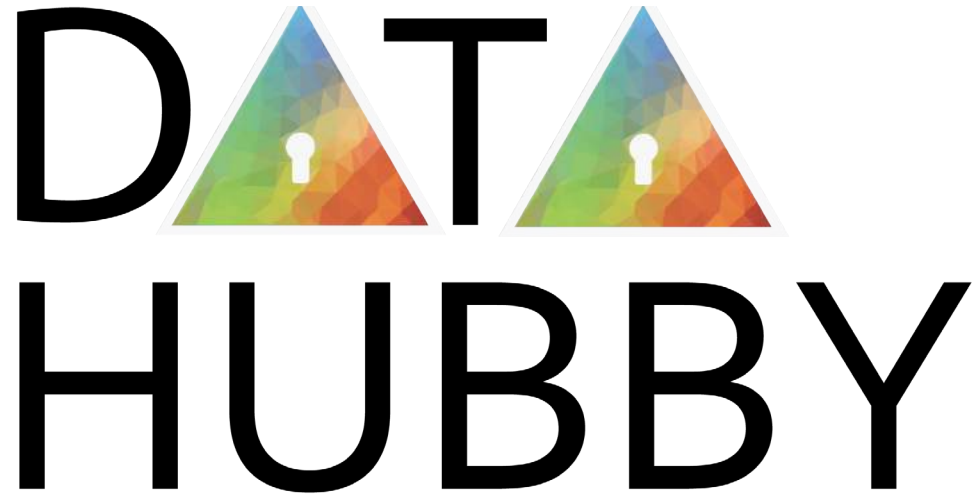
# DATA HUBBY

**Data Management and Transparency Platform with Personalized Offers from Partners**

Data Hubby is a platform that brings together data related interests of customers and businesses. It aims to increase data usage transparency while simultaneously utilizing personal data to increase customer satisfaction. In doing this, it brings together interests of both customers and businesses.

Currently, there is a lack of transparency and control of personal data usage [438]. Data Hubby solves this by creating data usage transparency and single-point data access for all online accounts. When a customer signs up with our telco partner, the stored data from the telco company will be transferred to Data Hubby (e.g. personal data, payment information, usage data, location data, etc.). Additionally, changes in Data Hubby will be transmitted to all related online services. Customers can also actively share their data with businesses and see how these companies will use data to send them

recommendations [439]. Every recommendation the user gets from the Data Hubby platform is annotated with what data was used to come up with the recommendation, giving a transparent overview of data usage [440]. This also provides businesses a way to increase trust with their customers. They can send out customized recommendations or coupons to target customers. Targeting users is as simple as specifying target attributes like age, demographics, location data, etc. The increased transparency and accuracy of targeting would increase the likelihood of a user trusting that recommendation and acting on it, making Data Hubby an effective sales channel for businesses.

Another workflow that is arduous for both businesses and users is identity verification. Data Hubby provides an easy-to-use interface for customers and businesses to expedite

this process. Businesses can integrate Data Hubby verification service into their own services and make the verification process simpler and easier for their customers. This solution is used for initial verification of the consumer and the identity is confirmed by matching the biometrics with the one stored in the telco partner database. In general, businesses can use the the service to validate personal information, such as addresses for their services. Customers can verify themselves with their telco credentials one time, and then use this verification for other services.

Overall, Data Hubby charges businesses to sign up on their platforms in a subscription based model. For the customer, there is no fee, but they are incentivized via discounts and offers to keep using the service for all data management and sharing.

## Value Proposition

**B2C:** Data Hubby uses analytics to recommend products tailored to the specific needs of the users. Upon registration on the platform, users have the ability to select businesses they want to share their data with. This is based on personal preferences and users can select from businesses such as fashion retailers, household retailers or food delivery services. In exchange, users receive periodic coupons and discounts, as well as personalized offers from these businesses [441].

Data Hubby offers a transparent overview of the personal data it collects from the users. Data Hubby also provides an authentication module, which users can use to log in to different online services. By linking all accounts to Data Hubby, users have a centralized overview and can update personal information and payment details for selected accounts with one click in the Data Hubby.

This platform eases the authentication process for users. They only need to remember the credentials for one platform instead of remembering multiple ones. In addition, Data Hubby also simplifies the identity verification process. Services which require a verified identity such as online banking or job portals can use the Data Hubby verification service, which saves time and leverages the user's trust in the telco's data security.

**B2B:** The personal information customers share with Data Hubby cannot be reproduced or collected by other companies. We have information about customers' location and travel patterns, complete online behavior from the moment they open a browser until they close it as well as what times are best to contact them with offers. We offer companies insights based on this data, based on specific company requirements. With these insights companies can address our customers through the platform with personalized offers, therefore gaining a new customer access channel with a higher expected conversion rate [442].

Our services are also attractive for companies that require verified identity of their customers, such as banks or online payment services. We offer a verification solution that is not only cheap but also trustworthy. With our verified user database and the integration of rising technologies such as face recognition and biometrics authentication, companies can be sure that Data Hubby user accounts are mapped to their real identities. By adapting our solution, companies do not have to develop their own verification solution, and consequently save costs and increase customer satisfaction.

## Customer Relationships

**B2C:** The key component for maintaining and fostering our customer relationship with our private consumers is the Data Hubby platform, since this is the central location where all customer interaction takes place. After successful registration at Data Hubby, users can login to the mobile or web app from any device to manage their personal data/accounts. To maintain the customer relation and to increase customer satisfaction, Data Hubby constantly improves user experience and personalization based on usage tracking and customer surveys. To ensure a close connection to the customers, the entire support of the platform is handled by the Data Hubby team.

In addition, for using our verification process, we leverage the existing store network and offer an initial verification solution in every store (e.g. fingerprint or facial recognition). All employees in the stores are trained to advertise and support customers in the usage of Data Hubby. We use our existing infrastructure as a multiplier for customer acquisition.

**B2B:** To address the needs of our B2B customers properly, two important cornerstones need to be considered: Personal contact as well as self service platform. Within the customer acquisition of B2B clients we build on the existing key account management system of telco providers. To increase the likelihood of acquiring new customers and maintaining existing ones, we leverage customer relationships of the existing sales force. Key account managers are capable of tailoring the Data Hubby solution to the client's specific needs. Data Hubby provides a separate business login to ensure a smooth ongoing operation for B2B clients. From here they can manage and review their campaigns, modify search requirements, and can immediately contact their key account manager. B2B clients can easily modify and change all necessary options at one central location in real-time.

## Channels

To build up a two-sided platform it is crucial to gain a critical mass of customers at both sides in order to have a working business model. Therefore, we differentiate between B2C and B2B.

**B2C:** Data Hubby is a new additional service to the telco provider's product offering and consequently it is important to create awareness within its existing customer base, but also use it as a differentiation feature for targeting new customers. We create awareness through marketing campaigns in the stores as well as through our existing channels, such as email newsletters and social media. These marketing efforts will help convince new users to sign up. After the registration in the stores, Data Hubby users download the app and sync it with the online account from our telco partner. Thereafter, users can set up and customize their Data Hubby account according to their personal preferences.

**B2B:** The top priority for acquiring the first B2B clients is to leverage existing business customers since the telco provider already maintains a relationship with them. After the first corporate customers have been successfully integrated into Data Hubby, the B2B marketing can be extended. Here we focus on presenting our new data analytics approach and the potential insights in relevant professional networks and trade fairs. Moreover, we will target specific newsletters and journals to gain a professional track record for our innovative approach. In terms of acquiring new clients, we focus on a direct sales approach and will leverage the telco's sales force. To be able to scale Data Hubby properly, we need to extend the sales force.

## Key Resources

**Businesses Partnerships:** Our USP towards the customers is that we provide a secure way to share their personal data with relevant business partners. Therefore, we need to bring on board a diverse and broad network of companies.

**Biometric Infrastructure and Verified Personal Data:** The first step for interested customers is to go to one of our service locations and provide us with their biometric information (e.g. facial scan or fingerprints). The service locations themselves and the technology enabling these services are a key

resource [443]. Also, the collected and verified personal data is a key resource in our dealings with third party companies.

**Data Analytics Expertise and Infrastructure:** In order to provide relevant insights, we require data scientists and data analytic experts to extract these from our data. We also need the relevant infrastructure in terms of graphic processors and data storage for our data analytics.

**Technology Expertise and Infrastructure:** This is our technical development team that will be responsible for building Data Hubby and keeping it running. We require expertise in web and mobile application development, secure data storage, dev-ops personnel, User Interface (UI) and User Experience (UX) expertise and a good Quality Assurance team. We also need scalable infrastructure in terms of servers to have good quality delivery of content through our application.

**Large Customer Base:** Data Hubby's success is linked to building demand and supply on both sides of the platform. We need a critical mass of customers who 'Opt In' to the service for data sharing in order to get third party companies interested. We also need third party companies that are interesting to our customers. Our key resource is our existing large customer base that can be converted to Data Hubby users.

## Key Activities

**Developing and Maintaining the Platform:** Data Hubby is an online platform. Therefore, development and updates are important to keep the customer base engaged. The platform has to be developed in a user-friendly, mobile-friendly way and has to be easy-to-use.

**Ensuring High Data Security:** It is absolutely essential to keep the data that our customers and businesses entrust us in the safest possible environment. Significant effort must be spent to make sure that our data is stored and processed in a secure way. This must be an on-going activity to set up a secure infrastructure and keep it updated against the latest threats.

**Maintaining Data Quality:** All data collected, especially biometric data from customers, has to be of high and consistent quality to ensure a good service to businesses and people using Data Hubby.

**Analyzing Data and Matching Businesses to Customers:** A crucial component of Data Hubby is the analysis of personal customer data and sharing of generated insights to relevant third parties. Matching will be done in a completely transparent way to the customer.
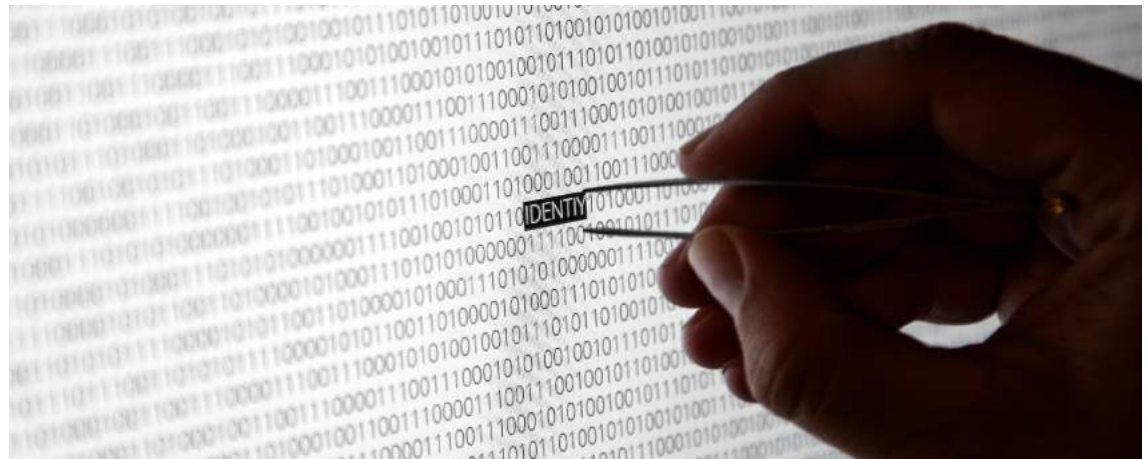
**Developing an API for Third Party Integrations:** Data Hubby is envisioned to be a central access point for customers to manage their data. In order for this to be viable, we must build API integrations into third party services that serve the following functions: A 'Log in With Data Hubby' function, an 'Opt Out', a "Verify with Data Hubby" and an "Offer Claim" API.

## Revenue Streams

Data Hubby has three main revenue streams. It charges businesses when they join the platform, then when they generate insights based on our data and lastly when they verify the identity of their customers using Data Hubby.

**Setup Fee:** Companies have to pay an initial setup fee for their onboarding. This fee covers all onboarding processes from technical integration to demos.

**Data Platform:** We have two types of subscriptions: basic and pro. Basic users can create simple queries to receive market insights. The queries are limited by the number of attributes they can use (5 basic attributes in one query). There are also some attributes that are not accessible for this subscription version (eg. location or behavior patterns). Basic users only receive market insights and cannot send recommendations. Pro users can use all features of the platform and are not limited. They can access all attributes, are not limited by the number of attributes in a query, and can send personalized recommendations. All data platform contracts are yearly subscriptions with monthly billing. To make our product also attractive for SMEs we will provide a special service for them. They are able to buy our basic subscription on a monthly basis. This is useful since start-ups and SMEs most of the time need our service only for one-time projects (such as location evaluation).

**User Verification:** Data Hubby offers two payment plans for the user verification. Businesses can pay for each verification or buy subscription packages. In the second case, the subscription packages would include a pre-defined amount of verifications, which are discounted. After every included verification has been used, the user will pay the default verification price.

## Key Partners

**Telco Company:** We rely on a partnership with a telco company for the customer base, the data stored for each customer, business relations, infrastructure and personnel.

**Data Analytics Providers:** A very important part of Data Hubby are the insights offered to companies. These insights are generated by data analysts and data analytics tools.

**App Store Owners:** The mobile version of Data Hubby will be available to download in every common app store.

**Biometric Verification Provider:** We need to partner up with a company with expertise in identity validation using face recognition or fingerprints. This partnership is crucial to help us setup the initial identification for new customers.

**Online Authentication Integrators:** We need third party online providers who integrate our "Login with Data Hubby" function, to make it easier for our customers to use it universally, and generate brand awareness.

## Customer Segments

Data Hubby is considered a multi-sided platform. On one side of the platform, we have the mass market of the customers from our telco partner seeking rewards, greater control and transparency regarding the usage of their data. On the other side, there are businesses looking for insights in consumers' behavior, identity verification and new sales channels for targeted advertisement.

**B2C:** Data Hubby addresses three target groups: First, it is intended for all customers from our telco partner who are interested in sharing their data with partner companies in exchange for rewards and personalized offers. Second, we address the needs of customers who are concerned about their privacy and would like a centralized overview of their various online accounts. Third, the quick and easy verification service offered by Data Hubby attracts customers that no longer want to waste time with complicated and time-consuming verification processes for services that require identity validation.

**B2B:** On the B2B market, we target businesses interested in making customized offers to potential consumers, as well as businesses in need of trustworthy identity verification of customers. Data Hubby possesses various data from customers, such as personal information, payment details, location, travel patterns, data volume usage, and online behavior. We can combine this information to generate valuable insights for companies in the area of retail, events, marketing, e-commerce, publishing/media etc., who are looking to target customers with personalized offers. In addition, we offer a special service for Start-up's and local shops to provide them with market insights regarding their location and business offering. Companies and institutions which require identity verification for their customers and are looking to optimize and simplify this process would also benefit from Data Hubby. These companies include online payment services, banks, insurances, credit check institutions, universities, or freelance services for age verification.



## Cost Structure

**Initial Costs:** Developing the platform is a big upfront investment. We need UX/UI designers, software developer and data analysts which can shape and develop the platform from a technical perspective. To build our data center we have to acquire relevant server infrastructure for storing and processing data. Furthermore, we have to acquire licenses for third party data analyzing solutions and implement them in our product.

**Fixed Operating Costs:** Data Hubby uses state of the art analytics software and CRM systems for which it has to pay licensing fees. As we would build our own infrastructure, main-

tenance is also one of the main operating costs driver. The infrastructure has to be highly secured both physically and digitally. To keep the platform up and running and to evolve it further we build up a software development team. From the business perspective the key account management and sales team are the most crucial cost components. They are responsible for the whole acquisition and onboarding process as well as maintaining the customer relationship. Lastly, administrative costs cover the office set-up and ongoing business operations.

**Variable Operating Costs:** As customer support is usually outsourced, the costs are variable based on the amount our customers or business partners encounter problems. In addition, marketing efforts are required for both B2B and B2C customers. The marketing costs will vary for each campaign and for the different target groups. Last but not least, we offer rewards to incentivize customers to use Data Hubby or even share their data. Rewards for our customers may include increases in their monthly data volume for sharing their data with our partner businesses.
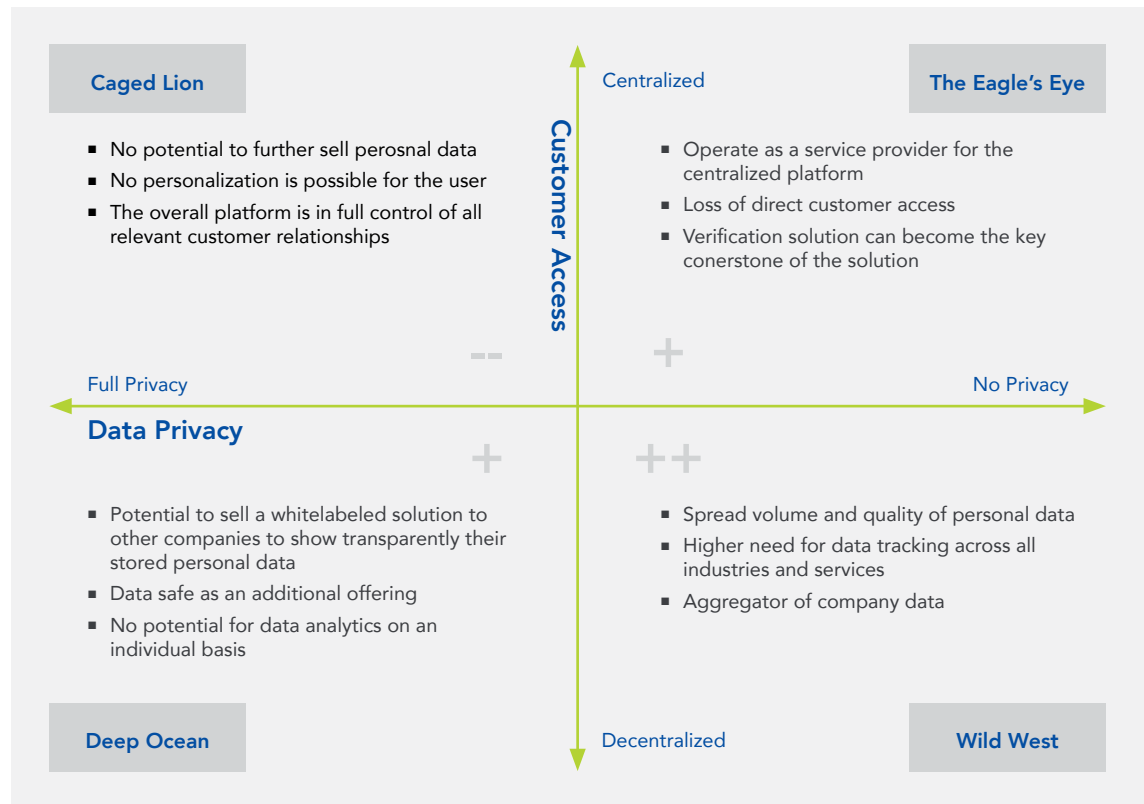
### Scenario Fit:

**The Eagle's Eye:** In this world, the centralized platform will be the data management hub, therefore Data Hubby will just be another service on the platform which is powered by the partner telco provider. For the customer, the interface is now the platform rather than the telco provider (who just operate it). However, the telco provider sells the matching of the customer to interested businesses. The telco provider will have less unique data in this scenario but will still own important data such as usage data, behavior data, location data, recorded calls, voice etc. which the platform does not control. It can thus provide even more in-depth analytics on user data and sell them through the platform to businesses. The problem in this scenario is that we do not have direct customer access and therefore are limited by the centralized platform in notifying target users. Additionally, the verification service is not valid anymore because the platform would most probably already have verified customers using it.

**Caged Lion:** In this scenario, the functionality of Data Hubby is highly limited due to full privacy of personal data and one centralized customer access. Data Hubby would need to be integrated into the centralized platform and would not be able to analyze or even sell data to B2B customers. Especially,

in terms of the authentication and identification solution, the centralized platform might be more suitable to offer these services. The centralized customer access platform would be ideal to integrate Data Hubby as a centralized personal data management tool in the platform. Within this setting, Data Hubby can fully leverage their expertise in authentication and identification solutions. In general, the centralized customer access platform will be the only customer for Data Hubby and the likelihood of getting squeezed out by them might be quite high.

**Deep Ocean:** In a world with full privacy and a decentralized customer access, it is relatively difficult to offer Data Hubby in terms of data sharing. The main issue is that data analytics and selling is not possible anymore, even though the need for insights would increase due to the fact that companies in a fully decentralized world own less data of their customers. The full privacy in the world will increase the need for data transparency platforms. Therefore, Data Hubby could offer its data transparency solution white-labeled to other online service providers. Moreover, the need for a proper identity verification within the registration process will enhance, and with the consent of the consumer the Data Hubby verification



**Caged Lion**

- No potential to further sell perosnal data
- No personalization is possible for the user
- The overall platform is in full control of all relevant customer relationships

**Centralized**

**The Eagle's Eye**

- Operate as a service provider for the centralized platform
- Loss of direct customer access
- Verification solution can become the key conerstone of the solution

**Customer Access**

**Full Privacy**                    **No Privacy**

**Data Privacy**

- Potential to sell a whitelabeled solution to other companies to show transparently their stored personal data
- Data safe as an additional offering
- No potential for data analytics on an individual basis

- Spread volume and quality of personal data
- Higher need for data tracking across all industries and services
- Aggregator of company data

**Deep Ocean**          **Decentralized**          **Wild West**

solution can be implemented on a broader scale. In addition, we would envision an additional feature of Data Hubby: The data safe. The customer can store its highly secure personal data there and they are verified by the issued institution (e.g. former employer or university). In case the customer needs to provide proof, it can be easily done via the data safe through an encrypted data exchange.

**Wild West:** A world with no data privacy and decentralized customer access represents the ideal scenario for Data Hubby. A platform like Data Hubby is highly needed in a world where there is no data privacy because customers would benefit from a platform that tracks where their data is and how it is being used. Since the absence of privacy plays an important role in this world, consumers might also be willing to pay for the services offered by Data Hubby. In this scenario data is totally decentralized and therefore the data owned by individual companies is not valuable on its own. Data Hubby has the ability to collect data from different companies, analyze it and provide valuable insights back for a fee. Furthermore, our telco partner has the ability to use the collected data to generate personalized offers to their customers.

### Challenges:

- Legal situation, which restricts companies from analyzing and selling sensitive data about their customers
- Identifying the optimal incentive strategy for customers to keep them interested in the platform and its services
- Potential business-side backlash, as businesses might not like to be transparent with what they do with customer insights
- Data quality, leveraging the existing customer data and analytics expertise needs to create valuable insights for business partners who are willing to pay for this service
- Data security, as a data leak could compromise the system and the trust from the customers
- Raising customer awareness for privacy to get them to use our centralized data management platform

### Outlook:

Data Hubby aims to be the leading platform in secure and transparent data management, as well as a valuable player in the Analytics-as-a-Service market. We want to increase precision and value of our analytics by aggregating data from individual business partners with ours and deliver powerful insights to them. We plan to later combine data from various online partners and generate more detailed insights about individuals. We rely on the willingness of our partners to share their data with us, which we want to achieve by either not storing the partners' data for future use or lowering the prices in exchange for data. In the future, we want to offer our identity verification service to customers from different telco providers as real and secure data becomes more and more important for institutions and governments. With the advancements in face recognition technology and their integration in smartphones we can optimize initial in-person verification and offer the identity verification in other countries as well. After Data Hubby becomes the go-to platform for recommended offers and analytics we plan to develop our own payment solution to allow customers to pay for selected offers directly through our platform without having to share their bank information with third party services.

# ORCHESTRA

**The Trusted Platform for Industrial IoT**

Orchestra is the trusted platform for enabling industrial companies to realize the full potential of IIoT. Embracing IIoT – also called Industry 4.0 – is not only essential because customer expectations are rising [337], but also due to the fact that maintaining a competitive advantage is becoming difficult without digitization [444]. However, many corporations in Germany are reluctant when it comes to implementing IIoT solutions: they not only raise security concerns but are also faced with the challenge of a fragmented IIoT landscape [444].

This is where Orchestra can offer a unique value proposition. By providing a unified IIoT platform that functions as an abstraction layer, Orchestra ensures interoperability with a broad range of software and hardware providers. Due to reduced complexity, entering the field of IIoT successfully becomes achievable, especially for small and medium-sized companies. Protection of production critical assets and processes is guaranteed. Lastly, Orchestra provides entry-level analytics and fosters industry-specific services through a third party microservice architecture.

Revenue streams for this business model materialize as one-time direct revenues from implementation as well as recurring subscription fees. Additionally, indirect revenues can be collected over commissions when third party microservices are deployed. Lastly, insights gathered on the platform can be anonymized, aggregated, and sold.

Orchestra is rolled out in one specific vertical for the launch. Logistics and transportation is a compelling entry point as connectivity know-how can be leveraged for integrating mobile assets. In the second phase, telco providers can make use of existing customer relationships for ramping-up the platform. In the long-run, Orchestra is an industry-independent one-stop solution.

While competition in the IIoT area is fierce, telco providers have the unique chance to leverage their existing assets to succeed. First, the network infrastructure and know-how which telco companies own is of critical importance, especially for connecting mobile assets and various productions sites. Second, the security expertise is a key success factor in supporting customers and maintaining trust. Third, telco providers can act as independent operators providing an abstraction layer for ensuring interoperability between various players. This entry point can then be harnessed to become an end-to-end IIoT platform, ensuring a strong market position as an intermediary in the IIoT field in the future.

## Value Proposition

Orchestra offers three main benefits for companies implementing the platform solution: efficiency gains by realizing the full potential of IIoT, increased flexibility by ensuring interoperability over an abstraction layer, and security by protecting production critical assets and procedures in a digital world. While the IIoT landscape is fragmented, Orchestra allows companies to funnel their digitization efforts of production plants and warehouses. Included basic analytics services allow corporations to gather insights into their processes and therewith, for example, reduce downtimes. If industry-specific applications are required, additional microservices from third parties can be integrated and deployed directly through the platform. Thus, Orchestra helps to improve the process flow, which leads to a robust (production) environment. Significant time and cost savings can then be achieved, resulting in substantial efficiency gains.

Orchestra increases flexibility for customers by providing an abstraction layer to facilitate interoperability with established sensors, devices, and platforms. Thereby, companies are no longer bound to a specific hardware manufacturer. This reduces complexity while allowing maximum flexibility in the configuration of each company's IIoT landscape. The abstraction layer not only enables easier setup, but also provides long-term upward compatibility and interoperability.

Orchestra ensures the security of production critical assets and procedures with state-of-the-art encryption and cyber-crime protection. Cybersecurity concerns arise as customers fear data leakages and lack the expertise in protecting their assets in a digital world. With an increasing international competition, the process know-how is often the only key differentiator to ensure a competitive advantage for industrial companies in Germany and Europe. Telco providers, in contrast to web giants, are trusted regarding data protection. This trust can be leveraged and maintained by helping customers ensure security in the IIoT space.

These three key value propositions combined with the existing assets of a telco provider will lead to a unique, successful platform solution in the competitive field of IIoT. Through Orchestra, telco companies will not only improve the existing IIoT efforts of companies, but will also enable doubtful and cautious companies to implement IIoT solutions.

## Customer Relationships

After customers decide to implement Orchestra, their journey to leverage the full potential of IIoT starts. Being a one-stop solution, Orchestra aims to make it as easy as possible for customers to fulfill their IIoT related goals. Cooperating with a broad range of partners enables mission critical expertise along every step of digitizing customer's plants.

**Trust:** The customers trust Orchestra with their most critical production assets and know-how. Therefore, a relationship with a high level of trust and transparency, instead of just a one-time transaction, is what Orchestra aims for. A dedicated sales representative is the first pillar in creating a seamless customer experience. To build up trust right from the start, Orchestra employs sales representatives with industry-specific know-how as well as a far-reaching expertise in IIoT.

**Dedicated Advisor:** For the implementation, tailored consulting services regarding the customer-specific usage of Orchestra and digitization of production facilities in general becomes crucial. At this time, a dedicated advisor is allocated to the customer. The advisor assesses customer needs and processes on-site with the goal of aligning customer interests with Orchestra as best as possible. In addition, the advisor is the central point of contact and provides continuous support during the customer lifecycle. Whenever customers want to, for example, deploy a new microservice, add a machine or even a new production plant, the advisor guides them through the challenge by providing a solution with Orchestra and its partners.

**Customer Support:** In addition, support is available round-the-clock for each customer. This also helps deliver the security customers get promised when deciding for Orchestra. All in all, Orchestra builds a trust-based relationship through expertise and support in every step throughout the customer journey.

## Channels

In contrast to the B2C segment, offline sales and customer interaction still dominate the B2B world. This phenomenon stems from the more complex nature of products as well as the higher sales volume.

**Offline as Main Channel:** The decision to funnel the IIoT efforts through Orchestra from a customer perspective is far-reaching. Therefore, the main channel to raise awareness and to interact with the customer is personal offline sales. Orchestra focusses on skilled sales representatives with industry-specific know-how that understand customer needs and fears in the field of IIoT. Additionally, trade shows are an important channel to get in touch with potential customers. They also raise awareness about Orchestra due to the related media coverage.

**Distribution Partnerships:** Other ways to distribute Orchestra are resellers and IT-implementers. These partnerships increase awareness and customer reach while also providing industry-specific expertise. The resellers are selected thoroughly in order to maintain Orchestra's high quality and trustworthy image.

**Microservice Marketplace:** Another way to distribute Orchestra's services is the marketplace for microservices, which can be set up as an app store. These microservices can be deployed by third party software companies either as a customer-specific solution or a general offering.

**After Sales Customer Interaction:** As Orchestra wants to maintain a trusted long-term customer relationship, the after-sales customer interaction is very important. One touchpoint will be the dedicated advisors accompanying the customers starting from the implementation phase. They will provide personal support throughout the whole customer life-cycle helping the customers to continuously improve their IIoT solutions. Furthermore, round-the-clock customer service is available and can be provided through e-mail, phone or chat as part of the platform's interface.

**Online:** Although there is a focus on offline customer interaction, a comprehensive online and media strategy should not be neglected. Potential customers will research online to inform themselves about IIoT solutions in general and Orchestra in particular. Besides a website, mentions in journals and media can raise attention and give credibility by, for example, showcasing pilot projects.

## 🏭 Key Resources

Orchestra as an IIoT platform is centered around technology. The main resources, therefore, incorporate different aspects of technological capabilities.

**IT and IIoT Expertise:** First, skilled employees for developing, managing, and implementing the platform are essential. These employees need expertise in information technology in general and specific know-how in the IoT field. Besides having the capabilities to build and manage the actual platform, knowledge in connecting smart devices, managing a cloud infrastructure, providing interoperability, and analytics are necessary to become a trusted partner regarding IIoT. Sales staff needs the capabilities to assess the individual needs of customers regarding fulfilling their respective IIoT goals. Based on this assessment, an implementation strategy, including appropriate partner selection, can be developed in the next step.

**Cybersecurity Know-How:** SMEs in particular lack the expertise to secure their production critical assets and knowledge in a digitized world. Knowledge in cybersecurity is therefore necessary to be a trusted partner for the industry. Hence, assisting companies in securely digitizing their production processes in general is a key selling point. In addition, having the hardware in place to provide a scalable, secure cloud infrastructure is a must for a platform solution.

**Trusted Relationships:** The existing customer base is essential to acquire initial customers and to ramp-up the platform. Hence, leveraging customer relationships for cross-selling IIoT solutions is required. The most crucial factor in convincing potential customers, however, is the trust customers have in Orchestra in terms of protecting customer data and fulfilling the promises regarding efficiency gains through IIoT.

## 👷‍♂️ Key Activities

The key activities for Orchestra are centered around delivering a seamless, flexible solution to realize the full potential of IIoT.

**Acquiring IT Capabilities:** The fundament of success with Orchestra is to build up and continuously enhance internal IT expertise and capabilities by hiring technical talents and enabling the existing organization. To provide the organizational setting for developing software solutions, processes and decision making need to be flexibilized and agile ways to work need to be adopted.

**Establishing the Platform:** A key activity to ramp-up the necessary digital ecosystem is the development of the initial setup and the continuous curation of the platform, including providing basic microservices such as predictive maintenance. Without a sprawling digital ecosystem around the platform, customers would be forced to use external platforms and software to make use of specialized or advanced solutions such as industry-specific applications. Therefore, building partnerships with a variety of institutions is one of the key ingredients to succeed in launching and running Orchestra. Partners are necessary to foster the marketplace and provide compatibility with established products and services. The abstraction from different interfaces when developing Orchestra is also necessary to ensure interoperability with a broad range of hardware and software providers. In addition, standardizing interfaces can lead to efficiency gains in development of the platform as well as reduced complexity for customers.

**Implementing the Solution:** The implementation of Orchestra at the customer's local production site is a crucial point in delivering a seamless customer experience. Therefore, tailored installation and sales services based on the respective customer needs regarding the usage of Orchestra and production plant digitalization in general are fundamental. Corporate customers expect bullet-proof protection of their production's critical assets, which is why securing and updating the platform continuously becomes an essential task to maintain the trust image. This holds not only true for Orchestra's entry function as a flexible abstraction platform, but also for the long-term vision of providing an end-to-end IIoT platform.

## 💰 Revenue Streams

The business model of Orchestra consists of five potential revenue streams driven by software, data, and service.

**Software:** The most important revenue streams are generated by the software components, which consist of the platform and the digital ecosystem provided by Orchestra. Orchestra is a SaaS product and therefore a monthly subscription fee is charged that is based on the selected basic features, the number of access licenses, and the number of devices connected to the platform. Orchestra also offers a marketplace for third party microservices. It functions as an app-store for IIoT applications and generates an indirect revenue stream. These microservices are developed by a thriving community with special expertise incentivized to share developed solutions to compensate their internal development costs and to earn additional money. Orchestra hosts this marketplace and takes a commission for products sold through the platform.

**Implementation and Support:** Another revenue stream is derived from services around the platform. This includes support for implementation of Orchestra at the customer site to get the platform up and running as quick as possible.Additional revenues for special customer support requirements, such as premium round-the-clock and on-site support, also belong to this category.

## Key Partners

Partnerships are a critical factor in developing and managing a successful IIoT platform. On the one hand, working together with a broad range of players within the IoT field, such as hardware providers, ensures interoperability. On the other hand, partners within the software industry are essential to provide a sprawling digital ecosystem and thereby value-added services.

**Hardware Manufacturers:** By forming direct partnerships with a variety of hardware manufacturers, Orchestra is flexible regarding the underlying hardware infrastructure and therefore a broad customer segment can be addressed. These partnerships are especially crucial due to the entry strategy of building an abstraction layer to ensure interoperability and thereby to address the problem of a fragmented IIoT solution landscape. In addition, working together with standardization organizations, such as the IEEE Standards Association, is necessary to ensure compatibility with third party products and to influence the definition of industry standards.

**On-Platform Software Providers:** A sprawling digital ecosystem around the platform is necessary to deploy industry- and company-specific software solutions. The development of additional value-added services can be outsourced to microservice providers, while profiting from each sale indirectly through commission fees. Partnering up with software providers that develop applications for Orchestra also broadens the scope of potential customers due to various areas of application.

**External Software Providers:** Cooperating with other platform providers and providing interfaces to exchange data gives the customers even more flexibility. Thereby, Orchestra can either function as a data processor or data distributor. By providing interfaces to established business management software such as ERP solutions, Orchestra and its respective data insights can be integrated directly into

business processes. Real-time data insights even offer opportunities for completely new applications. Additionally, cooperating with different software providers by supporting a variety of software libraries is necessary to provide established toolkits andand frameworks for developers.



## Customer Segments

The main target group of Orchestra is asset-heavy SMEs, since they could profit the most from implementing IIoT solutions. German SMEs are especially cautious about risking their production-critical assets. They fear that implementing IIoT with the existing solutions will increase their vulnerability to cyberattacks. Addressing those fears by protecting the customer's mission critical assets is one of Orchestra's main value propositions.

**Transportation and Logistics:** Starting with a vertical market penetration, Orchestra focusses on one of the industries which can profit the most from IIoT. Logistics and transportation industry are such verticals suitable for the launch. IIoT services enable deep insights into the supply chain through tracking locations, movements, and conditions in real time. Thereby, the efficiency of mobile assets, production processes, and stock is tremendously increased.

**Manufacturing and Industrial Goods:** After the logistics and transportation industry, SMEs possessing production facilities are the next target group. The proactive analysis of sensor data in the production area helps manufacturing companies, for example, to reduce maintenance costs and downtime of production plants. Furthermore, using aggregated data from comparable plants allows for additional efficiency gains.

**Asset-Heavy Service Companies:** In the next step, service companies that are asset-heavy, such as the facility management sector, are addressed. The industry is operating under high pressure to reduce costs and increase efficiency of their buildings. These efficiency gains can come from IIoT applications such as predictive maintenance and optimization of energy consumption.

After building up expertise by continuously adding support for new verticals, Orchestra starts to adapt a horizontal market penetration strategy. The then sprawling digital ecosystem will provide industry-specific solutions without the direct input of the telco provider.

## Cost Structure

Orchestra is a multi-layer platform that aims to put a broad variety of third party products under its umbrella. The development and operation of Orchestra, therefore, results in various fixed and variable costs. The main fixed costs are personnel and software development while the variable costs mainly consist of implementation and ecosystem curation related expenses.

**Fixed Costs:** Starting with the fixed costs, special expertise is not only needed for the components of Orchestra, but also experts for third party products and different industries are required. This results in high personnel costs for developing, deploying, and maintaining the platform. In addition, providing the core services for the platform marketplace also requires know-how in data visualization, analytics, and security. These activities demand highly-paid data scientists, and ML and security experts. Because Orchestra aims to operate across various industries and deals with real-time process information, high service quality is a must. Therefore, a round-the-clock support team that can deal with industry-specific issues should be in place. The last major block in personnel costs can be found in sales. As Orchestra is a B2B product

with a focus on direct sales, a sophisticated and specialized sales team is required. In addition, a minor part of the fixed costs are investments in necessary infrastructure such as data centers for cloud services.

**Variable Costs:** The variable costs of Orchestra are small compared to the fixed costs. They mainly consist of implementation and sales related costs such as commissions. Additionally, as the platform ecosystem grows, quality assurance for third party microservices and community engagement will cause additional expenses. A strong community with a broad offering and high quality in microservices is required to foster the digital ecosystem and increase the value of the platform.

### Scenario Fit:

**The Eagle's Eye:** With a central customer access platform in place and no guaranteed privacy, providing security is the main selling point for Orchestra, while being a backend module. Without the protection of production critical assets, such as process know-how and intellectual property , companies cannot maintain their competitive advantage. Orchestra protects these assets of companies and enables them to operate in this scenario. All business functions are funneled through the centralized customer access platform, restricting customer access for the telco provider. In addition, the centralized platform is heavily interested in gathering as much data from customers as possible to leverage it for cross- and upselling. As Orchestra is trying to restrict data gathering to protect customer data, it is under pressure from the centralized customer access platform. All in all, the business case can be evaluated as relatively positive in this scenario due to the customer value Orchestra creates through data protection.
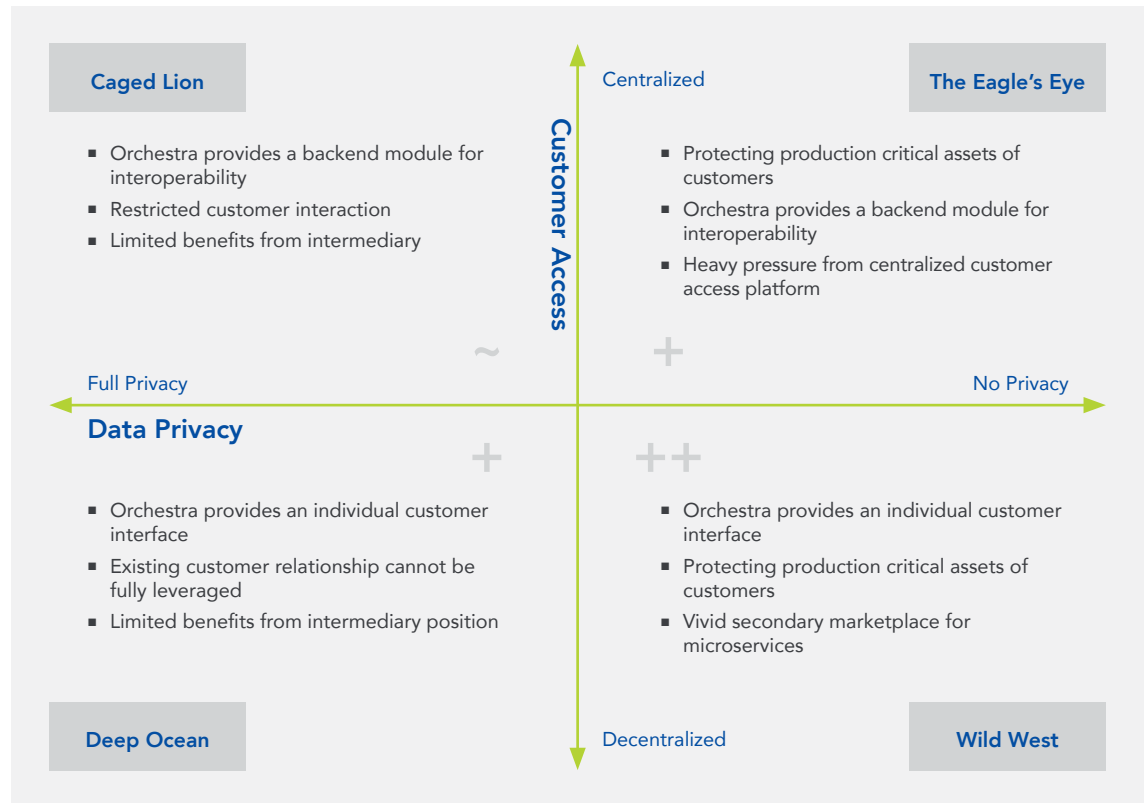
**Caged Lion:** In the world of "Caged Lion", Orchestra is as well a module for backend integration ensuring interoperability of IIoT solutions. As customer access is still centralized, all business functions are funneled through or executed from a third party platform provider. Therefore, an independent interaction with (potential) customers is not possible for Orchestra, restricting especially first-sales to new customers and cross- and upselling with existing customers. As full privacy is present and monetization of data is forbidden, telco providers cannot leverage the data and insights gathered on the IIoT platform to offer additional services, such as process improvement expertise. Orchestra may play an important role in ensuring security and protecting industrial companies

from the centralized customer access platform. However, in this scenario the business case is the weakest due to limited functionality, customer access, and value-added services.

**Deep Ocean:** In contrast to the first two scenarios, customer access is decentralized in "The Deep Ocean". In this scenario, Orchestra could evolve into an end-to-end solution with a direct customer interface. Telco companies can still leverage their strengths in customer expertise, cross- and upselling, however, is highly restricted due to full data privacy. With mutual agreements, telco providers can still implement the solution. However, no additional benefit from the intermedi-

ary position regarding data collection arises. Security is still an important value proposition of Orchestra, but the pressure to protect assets and fear of companies is limited. While the business model of Orchestra still works, opportunities for development are limited. Therefore, the business case in this scenario is only slightly positive.

**Wild West:** In "Wild West", Orchestra is not only a backend module, but can have an individual customer interface as customer access is decentralized. Telco companies have direct customer access enabling them to leverage their strengths in existing customer relationships and sales expertise. In a



| Caged Lion | | Centralized | The Eagle's Eye |
| --- | --- | --- | --- |

- Orchestra provides a backend module for interoperability
- Restricted customer interaction
- Limited benefits from intermediary

- Protecting production critical assets of customers
- Orchestra provides a backend module for interoperability
- Heavy pressure from centralized customer access platform

**Customer Access**

~     +

Full Privacy        No Privacy

### Data Privacy

+     ++

- Orchestra provides an individual customer interface
- Existing customer relationship cannot be fully leveraged
- Limited benefits from intermediary position

- Orchestra provides an individual customer interface
- Protecting production critical assets of customers
- Vivid secondary marketplace for microservices

| Deep Ocean | | Decentralized | Wild West |
| --- | --- | --- | --- |

fragmented and unprotected world, the competition tries to collect as much data as possible about production critical assets of other corporations. With Orchestra in place, customers can protect the assets they do not want to monetize. The know-how and data collected from Orchestra being an abstraction layer can be utilized to build an end-to-end IIoT platform. Therefore, the implementation of the business model is easy in this scenario and the options for future development are manifold, making the business case for Orchestra highly positive.

## Challenges:

- Competing with established technology companies and startups already providing a variety of platforms for different use cases
- Financing high upfront investment costs for developing the initial platform setup and enabling the organization to manage it
- Establishing a new business unit with clear responsibilities as platform model does not fit into the current product portfolio
- Acquiring expertise and capabilities in the fields of software, analytics, security, and IoT in general
- Ramping-up a two-sided marketplace and securing initial customers to leverage exponential network effects
- Gaining and maintaining the trust of customers regarding IoT and especially security topics
- Convincing hardware manufacturers and software providers to partner up or be compatible with the platform solution
- Speeding up and flexibilizing internal processes and decision-making to be competitive with agile software companies

## Outlook:

Orchestra is positioned in a very competitive but promising market. The field of IIoT is predicted to quadruple over the next years and reach a market volume of 50bn USD [383]. Orchestra follows an organic bottom-up approach to establish itself in the market. By starting with connectivity and interoperability services, Orchestra leverages the assets of a telco provider for the roll-out. As a next step, Orchestra focusses on the transportation and logistics industry as a first vertical to build an end-to-end solution tailored to their specific needs. This requires building up internal expertise to be able to address each of the layers of IIoT solutions above connec-



tivity, including device management, action management, data visualization, analytics, reporting tools, storage services, and open interfaces to third party applications. The resulting one-stop solution will then be adapted to other verticals. With this approach, Orchestra solves two of the biggest challenges in the field of IIoT: coherent security and interoperability. As this undertaking will require substantial time and resources, management commitment and strategic partnerships are necessary. This will allow Orchestra to grow to an established end-to-end IIoT platform that is secure, scalable and open.

# TELCC

## Differentiated and Customized Solutions for Customer Care

The central problem in customer interaction of many large telco companies lies in their high churn rate of more than 20% annually [445]. The increasingly high rate of customers who cancel their subscription to television, internet and telephone services makes it a topic of high relevancy, especially due to the strong competition in the German market. Besides better products, improved delivery methods, and enhanced marketing, satisfactory customer relationships and successful customer communication can be especially effective to reduce churn rates. TelCC proposes to tackle the problem of high churn rates by remodeling customer care and technical support as an intrapreneurial venture in the telco industry. TelCC will be set up as a standalone department with direct access to responsible executives in order to roll out the service efficiently and effectively roughly within three years.

The status quo for both customer care and technical support is a one-for-all solution which does not differentiate between customers and the severity of their issues and concerns. Since a negative customer experience resulting from bad customer care or technical support highly increases churn rates, TelCC's solution is to offer a differentiated service depending on the customer's emotions and demographics as well as the complexity of their issues. In practice, TelCC's approach is to make the customer summarize his issues in one sentence [446], and note his emotional state, either through an UI or voice analysis during the call. This basic service will always be the first customer touchpoint. The automated, AI driven system will then give an immediate solution for basic concerns, as i.e. contract runtimes or an updated payment method. As a study has shown, customers prefer an instant solution to

easier problems via chat bot or website to a personal phone call. If the issue is of a more complex nature, however, advanced services in the form of follow-up steps will be conducted. As it is a personal assistance specifically tailored to the customer's individual problem. In the near future, personal assistance will be combined with new technologies, such as AR and VR for technical support, and will also be focused on resolving issues instantly, guaranteeing coverage and mobile data connection. Large providers can address the losses by increased churn rates by setting up the additional TelCC department to deal with it. Increased customer satisfaction is going to lower churn rates. Customer loyalty and saved costs in the expensive acquisition process of new customers will thereby boost profits, especially in the long term.

**Business Model**

## Value Proposition

**Situation at a Glance:** For TelCC, the churn rate is the public enemy number one. A quick glance at the numbers in the mobile sector explains this focus. Revenues per user have been steadily dropping, especially for contracts, by 20% on average in the past five years. The churn rate resulted in a 500m EUR loss for one of the major providers in Germany in 2016. Aggregated churn rates for 2016 were over 20% of the entire mobile user base. This number dwarfs the meager 80m EUR invested in Customer Care for the same year. Our value proposition thus is not to undercut customer care in order to save some minor costs, but rather to drastically alter the customer care landscape to achieve higher customer satisfaction, thereby inducing a lower churn rate.

**AI as a Game Changer:** The way that customers are accessing customer care is also changing. 72% of millennials doubt over-the-phone customer care is adequate and wish for a quicker answer. TelCC introduces a two-tiered system for customer care that heavily relies on AI to quickly identify and resolve issues. Around 80% of queries could be answered by an automated system immediately. Drastically reducing the amount of customers forwarded to actual telephone contact would also free up resources to give better attention and care to those problems or customers that do require human interaction. A robust database that includes both aggregated and individual data about the customer would also enable a degree of personalization never before seen in the customer care landscape. Solutions and answers can be tailored to every individual, emphasizing the fact that their continued loyalty is much appreciated.

## Customer Relationships

**Individual Customer Relationships:** TelCC proposes to completely overhaul the existing customer support system in a major telecommunications provider. This approach enables the company to build individual customer relationships with every single user – as soon as they need customer care services. The main factors influencing customers' satisfaction with customer care are promptness, reliability, and empathy - TelCC fulfills all three.

**First Touchpoint:** The first interaction takes place through a chatbot. The chatbot's underlying AI can solve up to 82% of the problems immediately. In case the chatbot cannot handle the reported issue, the most suitable subsequent channel is determined. The customer, along with all relevant data, is then forwarded, eliminating the issue of redundant input by the user. This careful data handling and forwarding give the impression of being a valued partner and not one faceless customer more. As fewer, more urgent cases are handled by personal assistants, they are able to show greater empathy for the individual user.

**Flexibility and Customizability:** Additionally, the added flexibility of text or voice input allows users to access TelCC's services according to their personal preferences. The chatbot's around-the-clock availability is a drastic improvement over the usual call-center hours. The chatbot's underlying algorithms and systems are language-agnostic and voice recognition tools are available for a variety of languages. TelCC's automated services can then be offered in all major languages at a negligible marginal cost. This would benefit foreign-language speakers living in the country or businessmen needing support while traveling. This aspect can be leveraged especially well by multinational telco providers, acting in many different countries. In general, the increased quality of customer care in the telco provider will greatly enhance their brand image. As users build a relationship with the company, customer trust and loyalty will also be positively affected, with far-reaching consequences.

## Channels

**App as Primary Channel:** Customers can interact with the telco provider's customer care and have their problems solved in different ways. The first customer touch point is an app for initial interaction which provides instant, cheap service and is connected to the underlying platform and database. Since most providers already have a proprietary app, TelCC would seamlessly integrate into the already existing solution, avoiding the need for any secondary app download. As explained above, the customer can either type in his or her problem or send a voice message. Secondarily, TelCC's system works with the provider's website in a similar fashion as with the app. Ideally, there would be as few differences between the two as possible. Finally, the customer can contact the provider through a traditional phone call.

**Dealing with the Customer's Issue:** Once contact has been established, all three would work in a similar way. The main objective of the first contact would be to establish which channel is appropriate to deal with the issue described, as well as to forward the customer and the data as quickly as possible. For figuring out the second channel of interaction, TelCC's software does consider both the problem as well as customer specific characteristics. For identical problems for instance, the recommended second channel of interaction for elderly people would probably be a personal call in contrast to a chatbots for digital natives.

In the first two channels, data input and storage would be completely automatized, expanding the system's database on both the user and customer care in general. Phone calls would normally necessitate manual input, but simple problems could then be handled by the chatbot through the customer care representative as an intermediary. The decrease in waiting times for a solution will incentivize even skeptical customers to switch over to the digital solution.

Looking further into the future, new channels would open for customer interaction. Users could be offered a VR or AR solution to use with their own devices at home. These would enable them to fix even hardware issues themselves, without the necessity of a personal visit by a technician.

## 🏭 Key Resources

**Resources for Stored Data:** Large telco companies need some fundamental resources to run a successful transition to a TelCC division for Customer Care. These resources would mostly come from the assets already present in most major telecommunication providers. For the advanced services, existing assets such as databases and cloud storage may have to be expanded, in order to accommodate the increase in stored customer data and queried. For advanced services, the traditional customer service asset of call centers would be leveraged into TelCC's activities.

**Inhouse Tech Support and AI Expertise:** While not part of TelCC's core activities, dealing with on-site technical support is incredibly important for its overall mission. If prompt and easy customer care is not accompanied by competent technical service for the few cases that require it, brand image and customer satisfaction may suffer disproportionately. Once TelCC has been set up, the number of intangible assets grows drastically. Despite initial solutions being bought from providers such as IBM Watson, the department's in-house data analysts and AI experts would be able to attain expertise over time. As time moves on, they would ideally gain the capability to develop further solutions, either expanding or replacing existing products with ones optimized for the telecommunications business.

**Data, Data, Data:** Finally, the main key asset created and managed by the new department would undoubtedly be data. telco providers already have an unrivaled access to data from their customers, mostly of high quality. With an automatized data input by chatbots and other similar systems, the quantity of data would also increase, without the necessity of invasive procedures such as user data traffic monitoring or packet analysis. Data can then be analyzed on an individual and aggregated level. As the system becomes more engrained into the organization, departments will utilize the data outside of customer care. Sales and marketing would especially benefit from cumulative data on users' demands and habits.

## 🏃 Key Activities

**Implementation of the Chatbot:** TelCC's high profile activities are its core customer care services. From the chatbot and virtual assistant point of view, this includes the actual technical implementation of the service as well as integrating it seamlessly into the existing platforms provided by the provider. As described in previous sections, forwarding of the user and his or her problem in an efficient manner is extremely important for the added value of the system. Implementing that system also belongs to the new department's key activities. TelCC thus aims to solve the customer's problem as quickly as possible and with high accuracy and satisfies the customer's need for uninterrupted connectivity service.

**Inward Processes:** Beyond these outward-facing processes, many of TelCC's activities focus on leveraging its key asset: data. The first step of the chain is the collection of customer's data. Automatized collection through the app or website requires little additional effort. Much emphasis must be put on human data input. Customer care professionals with direct contact to the user will have a much deeper insight into the customer's needs. The main challenges are in the volume of data that needs to be accumulated, but also the security it is saved with. A data leak or hack of such personalized information would wreak havoc on a company's reputation and brand image. Once it has been ensured that thsis , mining, aggregation and analysis of the databases are the next steps.

**Possibilities to Further Leverage Gained Data:** In the long term, TelCC would slowly realize other key activities derived from gathering of expertise and refinement of the data. This certainly includes optimization of processes already running and the development of proprietary solutions to problems unique to the telco industry. Once the system has been in place for a while, an optimization of the customer care professional to user ratio may take place for cost purposes.

## 💰 Revenue Streams

**Indirectly Increased Revenues:** To make optimal use of TelCC, it should be integrated into a telco's existing structure as a newly developed division. Therefore, TelCC itself will not have separate revenue streams, but the overall revenue of the company will increase by introducing TelCC. Furthermore, TelCC helps to decreasing service costs and therefore offers an additional way to increase profits. Cost savings can be achieved through the advanced service, which is the fastest possible approach to find a solution for a customer's problem by the use of advanced technologies (i.e. AI driven chatbots, and virtual assistants for optimal usage of the gathered customer's data). This ML software will be highly efficient and identify important information immediately despite the immense data volume.

**Further Inhouse use in Other Departments:** On a second note, the additional data generated by utilizing the AI driven system will be very beneficial in other telco providers departments as well, as i.e. in sales and marketing. Ads can be differentiated and personalized to a higher degree which will increase revenue streams indirectly in the longer term.

**Future Outlook:** In the long run, by decreasing churn rates but maintaining or even enhancing customer growth rates, revenues from mobile, television and internet contracts will rise significantly. Large German telcos approximately generate 20 EUR to 30 EUR in revenue per month and user. Decreasing churn and maintaining or, by increasing customer satisfaction, even enhancing customer base growth, revenues will substantially increase for telco providers using TelCC.

## Key Partners

**Experts in the Field:** For building up the new customer care concept, cooperating with a number of key partners will be crucial. First of all, the new technology concepts including chatbots and smart allocation of the customer queries has to be developed. Inhouse AI specialists will manage the implemented solution and contact with suppliers. The gained knowledge will then be used in the long run to develop proprietary solutions. Exchange with leading chatbot development companies and collaborations with university researchers will speed up the development process. As the concept is based on the creation of a new internal department, it will also be crucial to stay in contact with the existing customer care departments. Often especially call centers are operated by a sub company. As they are part of the new concept they should be considered as one of the key partners.

**Strengthening Existing Relationships:** Furthermore, there should be a strengthened partnership with other internal departments that deal with customer data and its analytics, for example the marketing department. Existing methods to target the customer groups can be implemented and further improved using the new developed algorithms. By exchanging knowledge and customer data among each other, the different departments can leverage their work. Additionally the financing department will be the main contact for the budgeting of the new department and to prevent internal slowdowns direct C-level approval would be helpful. Relationships with high quality hardware manufacturers have to be maintained in order to provide customers with top-notch hardware. Execution of the developed algorithms and chatbots could be easily handled by an external partner. The internal IT department must also be included in the process to integrate the new technology into the existing environment.

## Customer Segments

**B2C:** TelCC concentrates on B2C services. Customer segmentation in the industry normally follows one of two patterns. In the first one, there is no customer segmentation, only a one-size-fits-all solution. This is true for example in low-cost contracts and most customer care solutions. In the second one, customer segments are identified following certain criteria such as income, family size, student status, etc. While the latter signifies a step towards customization, TelCC proposes a fundamental leap in this direction. Once the system is fully operational, each and every customer will experience customer service differently. Previously gathered data on the problem being reported, the customer's demeanor as well as the individual purchase and customer care history will alter the response that they receive for their query. Additional heuristics like the ones used in the second classical customer segmentation approach can be integrated into the system.

**Exemplary use of TelCC:** As an example, the elderly will most likely be forwarded almost immediately to a human operator in order to patiently solve their problem, while a highly-educated foreigner will receive text support through chatbots in his or her mother tongue. In the case of the first user, the customer care professional will have information about how the customer has reacted to advice in the past. If in the past, telling her to "reset the router" does not work, then "unplug and plug from the wall" might. The second individual will not have to sit through a telephone queue but will be given instructions that have been proven to help tech-savvy people, such as "check status of DNS settings". Customer segments and individualized answers will then grow naturally out of customer interaction.

## Cost Structure

**Initial Investments:** To roll out TelCC's concept, the new department must be set up. Especially the team of AI specialists responsible for the development and project management of the new technology will require some initial investment. Additionally, there will also be costs for the setup and hardware, especially of the new computation unit for running chatbots and analyzing data which is generated during customer interaction. These costs will also include the integration of a new web interface and an app to allow the customers to use the new service instead of just calling a service hotline. Im-

plementing the new customer care concept will also reduce costs in the call center part of the business, because tasks which have been done by employees are now handled by chatbots.

**Long-Term Outlook:** Currently, according to a study of IBM, 83% of customer queries can be solved by AI [446]. This will save a tremendous amount of costs because customer issues will be solved quicker and labor costs in call centers will be saved. Moreover, former call center employees could potentially be re-trained for other functions within the telco company. The competencies of the service people can be used only for cases where they are really needed, resulting in a higher customer satisfaction. This will lead to a decrease in churn rate. On average, telcos must maintain a customer for longer than six months in order to become profitable with him or her. To achieve a growth in customer base, the acquisition rate has to surpass the churn rate. By lowering churn rate it will not only be easier to grow the customer base but also to save costs for customer acquisition.

### Scenario Fit:

**The Eagle's Eye:** In this centralized and no privacy scenario, great opportunities for personalization exist, since personal data about customers can be gathered, analyzed, and used comprehensively. Possibilities to gather customer data include TelCC's platform as well as customer information from the telco's divisions. Therefore, individual customer problems can be tackled in an individualized and highly efficient manner. As in quadrant IV, there is a necessity to build up an organized database to efficiently access the accumulated data. Centralization influences the way the customer interacts with the telco provider. In a centralized scenario, all touch points are controlled by one intermediary and the customer interaction during service might be the only interaction with the customer and therefore of higher importance. The scenario will yield the second highest degree of customer satisfaction due to a personalized and customized service. Difficulties might arise due to the reduced access to the end customer due to centralization.

**Caged Lion:** A centralized, full privacy scenario is marked by limitations in personalization possibilities. Flexible plans cannot be individualized to the customer's problem history. As data storing, analysis, and use for personalization and customization is very limited, the telco provider has to use a

one-for-all solution for customer care and technical support. It will be difficult to access past customer data when an issue occurs, which makes it challenging to offer the differentiated customer care package TelCC aims to achieve. Customer care and technical support will most probably still be the same formidable task, since internal data is only available from sales and on an aggregated level. Because of the centralization, there is the advantage of a single central customer touchpoint, which increases convenience in customer interaction by only having to deal with a single platform, which is TelCC.

**Deep Ocean:** In a decentralized, fully private world, TelCC faces key restrictions. Full privacy would result in very strict regulations for data storage and access of user information; analysis and personalization capabilities could be strictly limited. The prospect of time limits on data retention may also further restrict the possibility of data mining and pattern analysis. TelCC may need to obtain data from other sources, such as sales, to better tailor their customer care offerings. Decentralization of customer access means that telecommunications providers have a privileged contact with the consumers, since they resemble the one gateway to connectivity. This would ensure a wide user base accessing customer care



**Caged Lion**
- Limitations in personalization capabilities
- Necessity for customer care remains

**Centralized**

**The Eagle's Eye**
- Great personalization capabilities
- More restricted access to customer
- Fewer options for the customer to interact with teclo providert

**Customer Access**

Full Privacy — **+** — No Privacy

**Data Privacy**

~ ++

- Limitations in personalization capabilities
- Necessity for customer care remains
- Increased control over customer touchpoints

- Best personalization capabilities
- Enhanced leveraging of customer data
- Provider has full control over touchpoints

**Deep Ocean** — Dezentralized — **Wild West**

and feeding the system. In general, the necessity for quality, prompt customer care remains. TelCC may need to shift to a more generic approach, or more modest goals. The added value in terms of satisfaction and thus reduction of churn, however, remains.

**Wild West:** A decentralized world with no privacy is the best scenario for what TelCC envisions as the future of customer care. No privacy means few to no limits on data access and retention for customers, even at a personal level. Users looking for support can then benefit from their whole interaction history to optimize their experience, ensuring their long-term loyalty. The vast amounts of data gathered can easily be leveraged by other departments and more invasive data gathering technologies can be implemented with ease. Massive amounts of data could result in new revenue streams as regulations regarding monetization are relaxed. Decentralization means that users go through their telco provider for most connectivity services. This maximizes the number of touchpoints available, which can directly feed data into the system. All in all, a Wild West scenario would turn TelCC not only into a viable customer care approach, but potentially a revenue-generating asset, essential to the business model of a telecommunications provider.

### Challenges:

- Chatbots need to be trained for approximately five weeks to achieve satisfying results [439]
- Sufficient technological development of chatbots for use in a commercial environment
- Large telco providers' internal dynamics averse to setting up a new department
- Acceptance of chatbots as a means of first interaction with the company on customers' side to still maintain brand image
- Hiring qualified employees, especially experts in the field of AI

### Outlook:

The future of customer interaction in Customer Care and Technical Support will be more efficient, more effective, and lead to higher customer satisfaction. Customers will receive answers to their basic questions and issues virtually instantaneously and enjoy fully personalized, differentiated assistance in case of more severe issues and concerns. TelCC's outstanding use of new technologies, especially in technical support, will lead to less downtime in television, internet and telephone subscription services for their customers. This venture, however, will presumably face adverse internal dynamics as a new intrapre-neurial department will have to be implemented. Furthermore, TelCC's success will be dependent on experts in the fields of AI, computational power, and organizational structure to be executed in an expedient way. Through the aforementioned approach, TelCC has great potential of increasing customer satisfaction, thereby decreasing churn rates, and in the longer-term decrease customer acquisition costs.

# OMNIA

**Providing the First True Computer-as-a Service Solution**

Currently there are multiple 'as-a-Service' solutions in the market: there is SaaS, Computing-Power-as-a-Service, and even Hardware-as-a-Service. All of those solutions offer specific Products-as-a-Service and have been enabled by an increasingly connected world. However, none of these products stand by itself. With Omnia, this will change: the goal of Omnia is to provide a Computer-as-a-Service solution which eliminates the need for any local computing power or processing device, thereby combining the above mentioned as-a-Service-solutions. With Omnia, every device capable of visualizing output can become your personal computer interface. These devices can be traditional screens, lenses, AR glasses or holographic projections. The underlying computing is handled in remote data centers while users will only stream the output on their preferred medium.

Omnia eliminates any barriers that are currently in place. When buying a computer, one has to choose between affordability, mobility, and power. There are powerful and portable laptops, though these have a substantial price. When focusing on low-cost, one either can choose a very heavy and immobile computer or a computer that has limitations in its performance. With Omnia, making a trade-off between affordability, mobility and power becomes obsolete.

Omnia follows a SaaS business model for both the B2C and B2B segment. The Computer-as-a-Service solution of Omnia also enables consumers to seamlessly switch between output devices and facilitates the usage of external software applications substantially. Users can stream results on their AR glass, then deciding to switch to a screen on the desk to continue working there. Trying out new software is merely a click or gesture with Omnia, as all software applications are integrated into the platform already.

Finally, Omnia eradicates any limitations that are currently set by hardware. As computing power is completely offered as a service, customers can run highly demanding tasks without having to worry whether their device can handle it. Thereby, Omnia offers maximum flexibility and convenience to its customers.

**Business Model**

## Value Proposition

With Omnia, you will never need to buy a computer again.

**Providing Computer-as-a-Service for Every Interaction with a Personal Interface:** The vision of Omnia is to replace all laptops and computers with a simple screen or other visualization device to which users only stream their personal computer interface. The computing power and storage to support this is provided through Omnia's data centers, thereby eliminating any possible privacy concerns. Similarly, Omnia uses the telco provider's network, one of the most reliable premium networks.

**Seamless Transition Between Devices and Visualization Methods:** As users are not relying on one single device for their internet access or entertainment, but rather a multitude of different devices and media, Omnia completely revolutionizes the way customers view and use computers. With the rise of connected homes, almost every device or furniture might be equipped with a connectivity module and possibly a visual interface. The user can seamlessly switch between the different devices he is using, without losing information or having to restart applications.



**Reducing Local Hardware Needs, Necessary Investments, and the Maintenance:** Businesses who are maintaining their own IT-infrastructure and have to replace their laptops every few years due to computational constraints, are facing big investments and sunk costs. With Omnia, they can outsource the maintenance and only need to buy screens or other visualization devices to stream Omnia and replace expensive laptops. Private users can benefit from not having to decide on technical specifications of their laptops as well as a low entry barrier/initial investment, as visualization devices are significantly cheaper.

**Providing Easily Scalable Computing Power Remotely:** Customers who temporarily need more computing power or memory for certain tasks such as rendering a 3D model or gaming, can easily upgrade their current configuration. This gives more flexibility to end users as well as businesses, as they can react to changes quickly.

**Flexible Usage of Software Licenses and Products:** Omnia controls the operating system as well as all integrated apps and can offer easy access to special software applications. Users can add them on an on-demand basis, having only to pay for the real usage, which gives the user maximum flexibility.

## Customer Relationships

VRena has several partners with different areas of interest: Omnia is providing customer relationship through several offerings, all flexible enough to be tailored individually to the customer's need. The activities itself are not going to be differentiated between the B2C and B2B segment.

**Onboarding Process:** To provide best-in-class customer relationship management, measures to both enhance the value proposition as well as to provide seamless support are going to be implemented. In the first step, the user receives a personalized onboarding process, which is based on individual usage and experience level. Thus, all customers are going to receive online training on any additional use cases and features.

**Analytics Dashboard:** Throughout the usage period, individual analytics are going to be available for each customer on a personalized dashboard. This dashboard allows customers to have full transparency on both their processing and storage demand as well as generated costs. The individual usage statistics contain vast upselling potentials, as they allow customers to realize cost-saving potentials by upgrading to bigger packages, based on their consumption.

**Newsletter:** Biweekly updates on new offerings and technological developments are going to be sent out as a newsletter and published on social media channels. This way all customers stay up-to-date on the latest trends through their telco provider and ultimately buy new technology from them.

**Automated Customer Support:** The first line of customer support is going to be automated through smart chatbots, enabling instant support worldwide. Customers have the option to describe their problem and be automatically directed to online resources aimed at solving the issue. Additionally, an online community aimed at providing each other support and sharing best practices is going to be built around the product.

**Software Ecosystem:** Omnia is creating lock-in through the add-on software ecosystem, which is part of the Computer-as-a-Service solution. If customers switch to a different provider, they also lose access to the used software, raising the switching costs substantially.

## Channels

**Distribution:** The distribution channels are comprised of two different categories: direct and indirect channels. The main direct channel is through an online shop, as Omnia will either be sold in a bundle with connectivity or separately if it's sold to existing customers of telco providers. The synergies between Omnia and providers make this a perfect fit and a natural cross-selling opportunity. The most important indirect channel will be created by bundling Omnia with hardware products. Any hardware producer can make his visualization device compatible with Omnia and thus sell the Computer-as-a-Service with it. Also, Omnia will be sold as a white label solution to virtual telco service providers who do not own infrastructure, thereby creating another valuable indirect sales channel.

**Promotion:** To demonstrate the value proposition of Omnia, the company is hosting tech events, conferences, hackathons, and exhibitions. The goal of such events is to show how the interaction with a computer becomes simplified by using Omnia. To demonstrate the power of Omnia in special use cases, the company is hosting gaming and data science conventions where participants can experience the flexibility of real-time adjustment of the virtual hardware to the requirements of the user's applications as well as the seamless transition between devices.

Omnia values the customers' wishes for a fully integrated software and hardware ecosystem. Therefore, Omnia launches on- and offline campaigns in cooperation with software manufacturers to demonstrate the flexible usage of software applications. With Omnia, every software is preinstalled and ready to use with only one click.

## Key Resources

**Infrastructure:** The first key resource is the technological infrastructure of telco providers, delivering high-speed internet access to customers. This includes the physical network structure and the software to manage software loads. Additionally, data centers and processes needed to maintain such an infrastructure. A high-speed and low-latency connectivity is required for users to access their personal computer interface. As this is streamed from remote data centers, only with sufficient connectivity can it be accessed without any lag.

**Marketing and Sales Network:** Omnia exploits the existing customer base and premium brand. To build synergies in core values, Omnia offers the possibility to upgrade the existing connectivity deals with an easily accessible, personal computer interface. This constitutes an excellent cross selling opportunity for telco provider.

The already existing marketing and sales network is focused on addressing big target customer segments and a high number of customers. This simplifies the integration of Omnia into existing marketing activities, further leveraging the existing resources.

**Software:** Omnia is developing proprietary algorithms addressing two key issues in the value chain: User experience and high quality connectivity. Omnia ensures a smooth user experience through its in house designed and developed user interface for the different visualization devices such as smart lenses and holographic projectors. Furthermore, Omnia develops its own software to guarantee compatibility with existing hardware devices, which makes an integration of new visualization output devices easily manageable. To secure a high quality service, Omnia develops algorithms to ensure low error rates for a smooth service usage.

## Key Activities

Omnia provides a platform through which the users can access their personal computer interface. The underlying framework for this interface is running in distributed data centers and is maintained and further developed by Omnia. For streaming the interface to each customer's device requires compatible visualization devices, massive data centers and an all-encompassing high-speed, low-latency network. To fulfill this vision, Omnia implements the following key activities:



**Administering and Operating Data Centers:** Omnia can utilize the existing knowledge for building data centers from telco providers with their comprehensive Cloud solution, to develop and then operate a dense network of data centers, enabling a low-latency connection.

For easier access and support in development of specific properties and setup, Omnia is also partnering with manufacturers of processors and server infrastructure.

**Integrating Software Applications into the Platform:** Including software providers in Omnia involves costs such as the development of API and integration costs. However, it also creates a two-sided market, which Omnia then can make use of, as software producers have clear incentives to join the Omnia platform.

**Ensuring Mobile Network Connectivity and Speed:** It is vital that a high-speed, low-latency network is stable and available all the time. Complementing the best-in-class infrastructure, Omnia is going to heavily invest in the development of connectivity enhancing algorithms. This software maximizes the data transfer rate and minimizes the error rate and the latency of the existing connectivity infrastructure.

**Promoting Development of Compatible Devices:** Omnia is actively developing the software layer responsible for the compatibility of our service on the different visualization devices such as lenses or holographic projectors, since its availability is a key success factor for Omnia's vision. Furthermore, Omnia is enhancing its customer value proposition through partnering with hardware manufacturers, offering bundled products, making use of cross-synergies, and guaranteeing the availability of suitable hardware throughout Omnia's sales channels.

## Revenue Streams

Given that we are trying to establish a two-sided market, we can generate revenue on two different main channels: from end consumers (B2B & B2C) on one side and from software providers and telco service providers on the other.

**B2C:** On the B2C side of the market, we offer a subscription based model that differs in price for various products. Similarly to buying a laptop that has different technical specifications, products will vary in computing power and stor-

age, to cater to the various needs of our customer groups. A subscription based model was chosen in order to keep entry barriers low for new customers and also to provide a certain flexibility as this is one of Omnia's key advantages. Additionally to the base product bundle, consumers can buy additional capacities on an on-demand basis, in case they need it for tasks that cannot be performed with their standard specifications. For this service, we charge a price based on needed performance and time.

**B2B:** For B2B customers Omnia also offers a subscription based model, based on computing power and number of employees. Furthermore, we opt for less flexibility and therefore offer subscription on at least a yearly basis. Additional services or capacities can also be purchased in this setting.

**Software and Telco Providers:** Further revenue comes from commission fees of software providers. Software providers have an incentive to offer their product on Omnia's system, as it makes it way more convenient for end consumers to use it. Especially once a significant market share is reached, Omnia becomes more attractive for software providers as it enables them to reach a bigger customer base.
Finally, the possibility to offer Omnia as a white label solution for a commission fee to other telco service providers that are using the telco provider's infrastructure could create further revenues.

## Key Partners

**Data Center Provider:** As neither Omnia nor telco providers have competencies in offering Computer-as-a-Service, there is a need for data center hardware such as servers or network components. Manufacturers of these components are an essential partner for supplying these hardware components. Big investments in data centers are necessary to provide the computing power required for providing the personal computer interface to each customer. Omnia is still going to be responsible for the administration and operation of the completed data centers.

**Hardware Manufacturers:** For providing the personal computer interface, a screen or any accessory capable of visualizing output (lenses, holographic projections or AR glasses) are needed. Manufacturers of laptops or tablets might be reluctant to follow this trend as they would be reduced to

a mere supplier in the value chain. However, exactly such a supplier is required for Omnia. Especially in the early stages, a key partner in providing these visualization devices is crucial for success.

**Software Providers:** In addition to the necessary hardware partnerships, software partners are also essential to success. Software providers that enable their product to run on Omnia's system increase Omnia's value proposition to consumers. An easy integration for any kind of software is required, so that the customer is flexible in trying and using new software products. Software providers can also play a crucial role as an additional sales channel, referring Omnia to their customers.

**Affiliate Marketing and Telco Providers:** Omnia relies heavily on affiliate marketing through other channels, such as telco service providers. As they have direct access to a large base of non-Omnia customers, they can act as a central player in further boosting Omnia's success. Offering Omnia as a white label product for other telco service providers can solidify it as the go-to solution in the market.

## Customer Segments

**Professional Users:** Omnia is geared for professionals in fields of work which have a high demand for computing power or visualization. As most industries are relying on some form of data-driven development or ML techniques, they can enable a decentralized and flexible working environment to their employees without any drawbacks in hardware usage. Additionally, there are big saving potentials by focusing on their core competencies while outsourcing the managing of hardware and development from their own IT environment. The easy adding and canceling of software application subscriptions for specific employees improves internal processes for companies significantly, as they basically automate the managing and renewing of software licenses.

Professionals from the area of graphic design would highly profit from Omnia, as they could use it for rendering, 3D modeling and other computationally demanding tasks. For start-ups and freelancers, the proposition of not having to invest heavily into hardware, but rather accessing computing power on an on-demand basis is much more appealing.



**Private Users:** Similarly, Omnia caters to private users who want to consolidate their computer into one single interface or who do not want to invest into expensive hardware. Online gaming and other entertainment services, such as video streaming, require a very good and stable internet connection already, but removing the devices simplifies the setup for everyday users.

In a world with smart homes, where almost all devices are interconnected and capable of visualization, users can profit from Omnia by consolidating these devices into a single computer interface. By simply streaming the visualization of the interface, users can easily switch between different devices in their homes.

## Cost Structure

**Upfront Development Costs:** The initial costs consist mainly of building enough data centers in order to ensure the ability to provide the promised connectivity. In detail this includes the high-performance servers that process all tasks of clients and also the development costs for software to manage the services on the mainframe efficiently. Additionally, there are three different types of recurring costs such as data centers, connectivity and human resources.

**Recurring Costs:** Data Centers: One part of the fixed operating costs is the cost to set up the IT infrastructure, namely the data centers. The cost for running and maintaining servers can be classified as mixed, as they are partly dependent

on output. Here the costs of electricity are especially high. Providing customers with the performance of the servers increases the load on them and therefore the energy required.

**Connectivity:** In order for Omnia to work, there is the need to ensure connectivity and provide the best internet connection possible to customers. This requires maintaining and developing the infrastructure of base stations and signal transmitters. Substantial mixed costs are also expected in this segment.

**Human Resources:** Wages for technicians and software developers are part of the fixed operating costs, and will be significant. Human resource costs also incur for marketing specialists that are needed to build brand awareness and advertise the new service. Also, costs for advertising campaigns and marketing events are for simplicity considered in this segment. These are necessary to establish a brand and to acquire customers. To ensure high customer satisfaction, it is necessary to have a customer support department whose salary represents another fixed operating cost. Omnia has a courageous vision, which needs a lot of manpower to achieve it.

**Scenario Fit:**

**The Eagle's Eye:** In this world, customer interaction is centralized in a single platform and all data can be utilized. The lack of privacy laws enhances the Omnia business model in two ways. Firstly, it allows all companies to analyze their customer data to optimize their business model. The Computer-as-a-Service allows the analysis to be done everywhere, increasing both customer value and customer demand. Additionally, telco providers can utilize their customer and usage analytics data to perfectly predict future demand, reducing the marginal costs to a minimum. The centralized customer access, however, also makes it almost impossible for telco providers to create lock-in effects and have full ownership of customers. Omnia allows telco providers to enter a massive market creating huge value for the end-customer, allowing to make the most of their data everywhere in the world. Despite this, through the centralized access, Computer-as-a-Service is going to be commoditized, forcing telco providers to focus primarily on costs.

**Caged Lion:** In the centralized world with the highest form of data privacy, the benefits are limited. Data privacy laws reduce the demand for both storage and processing, as customer data must not be analyzed nor monetized. At the same time, telco providers are not directly interacting with their customers but all customer interaction is handled by one platform. Thus, telco providers can basically only offer a white label solution, which is implemented into the centralized platform, and differentiating themselves purely based on pricing. Delivering the solution becomes more expensive as telco providers themselves are prohibited from analyzing customer data to estimate future processing demand and infrastructure requirements.

Yet, even in this scenario, Omnia can still provide value for both the demand and supply side. Telco providers can still generate significant revenue as a Tier 2 supplier and become the cost-leader in the market. Through the centralized customer access, costs for acquiring customers are reduced. However, successful customer acquisition is heavily dependent on the central customer access point.

**Deep Ocean:** The decentralized market has many advantages for Omnia's business case. It frees up the way for Omnia's two main distribution channels: direct access to customers and partnership with intermediary telco companies. This

**Caged Lion**
- Large telco provider offers their service through the centralized customer access channel with a limited lock in effect
- Data privacy limits needs for CPaaS in some cases as B2B clients can not process personal data

**The Eagle's Eye**
- Large telco provider offers their service through the centralized customer access channel with a limited lock in effect
- No restriction on privacy concersn or data collection

Centralized

Customer Access

Full Privacy — No Privacy

**Data Privacy**

**Deep Ocean**
- Large telco provider controls the access point to the customers and offers the product directly in addition to the connectivity
- Data privacy limits needs for CPaaS in some cases as B2B clients can not process personal data

**Wild West**
- Large telco provider controls the access point to the customers and offers the product directly in addition to the connectivity
- No restriction on privacy concersn or data collection

Dezentralized

contributes to the sustainability of the revenue model. The decentralized market also allows Omnia to use its marketing channels to differentiate itself from other competitors. Furthermore, in this setting, Omnia is able to partner with software and hardware manufacturers to execute its business model.

Full Privacy presents some critical challenges for Omnia. Given that all customer data and activities with their personal computers are in the cloud, Omnia has to focus on advanced encryption and data privacy methods. It also limits the benefits of customer data processing, as stored data cannot be analyzed in this scenario. A further hurdle of full privacy is the difficulty in managing own products and data centers. Not being able to analyze the customer and usage analytics data will lead to non-optimal sales and inefficient data center utilization.

**Wild West:** Decentralization and no privacy is considered the best scenario for Omnia. In such a free competitive market, Omnia controls the direct sales and marketing touch points to its customers and can also directly partner with software and hardware manufacturers. In the absence of data privacy, those direct touch points allow Omnia to gather, store and analyze customer data, which can be monetized in different ways such as offering personalized services and customer interactions. Having no privacy will also strengthen the value proposition of Omnia, as it will increase the general demand for computing power for the allowed data analysis in this scenario. Not only the customers, but also Omnia will profit from no privacy in their core operations. Omnia can conduct predictive analytics for more efficient maintenance and utilization of their own data centers.

### Challenges:

- Ability to ensure widespread connectivity
- Competition risk with current big players (e.g. Amazon and Microsoft)
- Lack of support of hardware manufacturers
- Customer acceptance
- Privacy concerns
- Legal issues concerning liability in case of failure

### Outlook:

Fueled by the initially generated revenue of Computer-as-a-Service solutions and the rising demand for process-ing and storage, telco providers will invest heavily into data centers in order to keep up with demand. Providing both the connectivity and the processing power is key to deliver the value proposition to customers. Connectivity has been continuously improving in terms of reliability and speed in the past decade and it will play a major role for Omnia's future success and market share. Already now in 2017, speeds of up to 1 Gbps are possible with latency below a tenth of a second. This trend is expected to continue in the future, with new standards being introduced and past ones improved.

Critically, state-of-the-art connectivity infrastructure is being rolled out throughout the world, turning constant high-speed connectivity from a vision into reality. This trend is important for Omnia as it will enable the Computer-as-a-Service solution to be implemented on a large scale. Similar to connectivity, Omnia's Computer-as-a-Service will become a commodity with every visualization device being able to perform all necessary tasks. As the world gets more connected, Omnia will get more successful.

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# CUSTOMER INTERACTION IN THE TELCO INDUSTRY

Digital technologies are enabling an ever more connected world – in a private as well as business context – and have a significant impact on the telecommunications industry. Services are becoming more readily available and convenient for telco customers and businesses are able to optimize and automate processes. Increasing digitization, however, also leads to new and different customer expectations in B2C and B2B interactions. Digital natives especially are demanding in terms of new products and services. These trends lead to a growing urgency for innovative ways to turn insights on telco customer behavior into future-proof business models.

Technological development is opening up new possibilities to meet customer wishes through, for example, Artificial In-telligence, Natural Language Processing, Internet of Things, and Blockchain Technologies. However, growing processing power and analytics capabilities, combined with the increasing collection of customer data, also leads to legal challenges concerning data privacy and protection.

In this report, the authors first analyze trends in the field of customer interaction in the telco industry. From these findings, four scenarios are derived that vividly depict possible futures. In the final part, five business ideas are elaborated and validated in each of the four future scenarios.

The concepts ideated range from an Artificial Intelligence-based customer care package, an Industrial Internet of Things platform, to a Computer-as-a-Service business model and a platform for personal data management.

Gesa Biermann · Florian Lachner (Eds.)