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# How well does the European Digital Single Market Strategy and the Industry 4.0 Framework afford Digitalization Transformation?

## A Case Study of SAP SE.

MASTER THESIS

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# Abstract

The European Commission published the Digital Single Market Strategy (DSM) on May 6, 2015. As new technologies rapidly change the way economies consume, progress and communicate, the implementation of the strategy demonstrates the EU´s will to deliver and complete the digital single market, where previous attempts have been less successful.The DSM rests on 16 policy initiatives across 3 policy areas – better access, encouraging businesses to grow and creating the right conditions to ensure the growth of the digital economy in the EU.

Although the Commission has made the DSM to one of its top ten politic priorities, policymakers struggle to keep up with the fast speed in which new technologies develop. Given the large scope of the strategy, the focus was put on the policy area that encourage Member States to digitalize their national economies. Therefore, this analysis seeks to expand on the question *"How well does the European Digital Single Market Strategy and the Industry 4.0 Framework afford Digitalization Transformation? A Case Study of SAP SE"* to examine whether digital transformations of businesses are captured by the strategy and the German Industry 4.0 framework using a case study of the German software firm of SAP as illustrative example.

The empirical findings demonstrate four major issues. First, digitalization has been fueled by the development of advanced technologies that inspired new customer demands, which ultimately encourage the process of digital transformation in businesses. Second, largely diverging and fragmented Member States digitalization legislations add complications and make it hard for the DSM to capture all legislation under one regulatory umbrella. Third, business processes and operations with multiple impacts require fundamental redesign and interact with the external market. This raises issues of data security and privacy that are not (yet) accurately captured by the DSM and Industry 4.0 framework. Forth, satisfaction of customers has the biggest impact crossing business boundaries and requires the redefinition of business scope and business model transformation. The analysis of the case study suggest that digital transformation can be captured when identifying distinctive business dimensions (namely customer, process, product and ecosystem dimensions) that are not captured by the DSM framework.

# Preface

I want to dedicate this thesis to my parents, who never considered twice to enable me this education and the four adventurous years I got a chance to live abroad for in China, United Kingdom, Belgium, Ireland and the Netherlands. Thank you Mom and Wolfgang, for always being just a phone call away from home, sending over my favorite German treats, and bringing over hugs and sunshine when you came to visit me in one of my many destinations. Thank you Dad for always encouraging me to strive for more and reach for the stars. And a special thank you to you Mom, for making me the person I am today – I love you to the moon and back.

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However, without my beloved Gone Girls Jip and Ruud, I would not had been able to write my thesis throughout the troubled lockdown times of Corona. Thank you for the cheering up and the motivation shared during work skype calls. It was a bumpy road, but I am glad we did it together. Love you my babes and email to my heart whenever you feel like it! Another special thank you belongs to my dear friends Cemi, Toni, Cindy, Rinalds, Maxi and Chrissi in the home base back in Berlin, as well as Linda, Lavanya, Lucas and Torben from Hamburg, who never got tired of me being abroad and unavailable, cheering me up on cloudy days and staying the loyal friends that I am so grateful to have – regardless of the distance. And not forgotten are all my other dear friends Hanna, Michi, Luisa and Philip from Berlin and around, as well as Sara and Marionella from Dublin who found the time to read through a 150-page long script with comments, corrections and advice to help me finishing up this thesis.

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## List of Abbreviations

| | |
|---|---|
| **CFR:** | Charter of Fundamental Rights |
| **GDPR:** | General Data Protection Regulation |
| **DIE:** | Digital European Industry Strategy |
| **DPD:** | European Data Protection Directive |
| **DSM:** | European Digital Single Market Strategy |
| **DM:** | European Digital Single Market |
| **DT:** | Digital Transformation |
| **ERP:** | Enterprise Resource Management |
| **EU:** | European Union |
| **ISF:** | European Investment Stabilization Function |
| **LaaS:** | The Concept of Law-awareness |
| **SAP SE:** | SAP Societas Europea |
| **TEU:** | Treaty of the European Union |
| **TFEU:** | Treaty on the functioning of the European Union |

Technical Abbreviations & Services

| | |
|---|---|
| **AI:** | Artificial Intelligence |
| **API:** | Application Program Interface |
| **CRM:** | Customer Relation Management |
| **HaaS:** | Hardware as a Service |
| **IaaS:** | Infrastructure as a Service |
| **ICT:** | Information and Communication Technologies |
| **IoT:** | Internet of Things |
| **IT:** | Information Technology |
| **PaaS:** | Platform as a Service |
| **SaaS:** | Software as a Service |

| | |
|---|---|
| **SLA:** | Service Level Agreements |
| **SMACIT:** | Social Media, Analytica, Mobile, Cloud and Information Technology |
| **ToS:** | Terms of Service |

# 1. Introduction

Digitalization affects business across all boards and sectors, as new technologies rapidly change the way economies consume, progress and communicate. The changes of our digital world promise increased efficiency, productivity and growth rates. New forms of information and communication technology (ICT) have increased connectivity and created new opportunities for civil engagement and political participation. In this way technologies represent a game change from traditional business making.[1] Unfortunately, these developments are not without downsize and not from purely economic nature. Rather, digitalization of European economies also involves issues of freedom and democracy.[2]

Digitalization not only leads to the creation of new products and services such as big data analytics, cloud service, artificial intelligence (AI), software improvements, automatization and blockchain technology,[3] but also disrupts traditional markets. The EU has always played a key role in boosting competitiveness of the business sector through a variety of laws and investments to help Member States in developing cutting-edge technologies.[4] Throughout the past decades, the EU tried to catch up digitally with digital powers like the United States or China. This has proven a challenging process, as the market for new technologies in the EU must take a different approach according to the regulation of economic activity taking into account human rights and freedom and consider specific individual investment rules for its internal market.[5] Currently, the economy is experiencing a digital revolution that is transforming Member States economies, its industries, and businesses operating in the private sector.[6] The increasing use and collection of personal data, as well as behavioral nudging endangers fundamental rights of EU citizens.[7] As such, digitalization represents a cross-sectoral issue that has intersections in the broad fields of consumer policy, labor and economy.[8] With digital innovation and development speeding ahead, businesses are forced to follow and adapt to disruptive market changes and a broad range of Member States aim to capture digitalization through domestic initiatives and frameworks. Meanwhile, businesses are already on the pathway – or undergoing transformation – to adopt new technologies. Although the European Commission has made the creation of a *Digital Single Market* (DSM) in the EU to one of its ten top politic priorities,[9] policymakers are still struggling to keep up with the speed in which new technologies develop. Thus, Europe has key digital strengths that it can exploit for gains on its own within the DSM, but what is missing, is the recognition of what challenges businesses that operate or undergo digital business transformation. Especially, when considering that laggard businesses can encourage platforms to allow other less digitalized companies to achieve similar digital scale.[10] EU citizens and businesses expect the state to protect them while having a guarantee of security for both, the service provided, and personal data transferred and used. Particularly in cases, where the service of data or its infrastructure are not owned by the user themselves, but by businesses (i.e. in the case of intermediate services as cloud computing) which adds complexity for the EU to regulate.[11] Within its DSM strategy, the Commission articulated therefore added a focus on digitalization that misses to address concerns that arise from the fields of data security, privacy and law-awareness.[12] If the DSM however, would more explicitly support digital business transformation, the single market could profit from productivity and efficiency gains, that may follow from applications of advanced technology.[13] This could be achieved if the DSM and related Member States legislation would update the area of data protection with a focus on new digital technologies and services, such for instance the rather unregulated area of cloud computing.

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[1] Deloitte (2014) "Industry 4.0 Challenges and Solutions for the digital transformation and use of exponential technologies" accessed April 02, 2020, http://www.industrie2025.ch/fileadmin/user_upload/chen-delloite-ndustry-4-0-24102014.pdf

[2] Bundesministerium für Wirtschaft und Energie (BMWI) (2017) "Digital Policy for Business, Work and Consumers" accessed April 07, 2020, https://www.bmwi.de/Redaktion/EN/Publikationen/digital-policy-for-business-work-and-consumers.html

[3] Association of Certified Chartered Accountant (ACCA), "Audit and Technology Report" accessed April 02, 2020, https://www.accaglobal.com/content/dam/members-beta/images/campaigns/pa-tf/pi-professional-accountants-the-future.pdf

[4] Fenwick M., McCahery J. A. and Vermeulen E.P.M. (2019) "The End of \`Corporate´ Governance: Hello \`Platform´ Governance." *European Business Organization Law Review* **20**: 171-199.

[5] Pachuca-Smulska B. (2020) "The Impact of Regulatory Techniques on the Development of the Digital Single Market in the European Union: Selected Issues" accessed May 07, 2020, https://images.nexto.pl/upload/virtualo/c_h_beck/aa8fecf514498e4b497c2a01c7177908289d1b3e/free/aa8fecf514498e4b497c2a01c7177908289d1b3e.pdf

[6] European Commission (2015a) "A Digital Single Market Strategy for Europe (COM (2015) 192 final). Brussels: European Commission" accessed June 28, 2016, http://eur-lex.europa.eu/legalcontent/EN/TXT/?uri=CELEX:52015DC0192

[7] Kämper V. (2016) "*Die Kanzlerin entdeckt #Neuland*" accessed June 26, 2016, http://www.spiegel.de/netzwelt/netzpolitik/kanzlerin-merkel-nennt-bei-obama-besuchdas-internet-neuland-a-906673.html

[8] BMWI (2017) "Digital Policy for Business."

[9] Juncker J.C., Tusk D., Dijsselbloem J., Draghi M. and Schulz M. (2015) "Completing Europe's Economic and Monetary Union. Brussels: European Commission" accessed June 26, 2015, https://ec.europa.eu/priorities/publications/five-presidents-reportcompleting-europes-economic-and-monetary-union_en

This paper aims to offer a dogmatic triangular approach, by analyzing the legal, economic and political scope of the current DSM regulatory framework to provide clear insights, which gaps regulation needs to close in terms of data security and protection. Subsequently, this could enable businesses across the EU to gain and/or remain competitive on the international market. Since Member States differ in their national regulation, a dynamic development of the digital market (DM) has started, but further harmonization is necessary to provide a coherent legislative framework. EU policymakers need to come to an understanding that businesses play a key role in accelerating the EU´s digital transition. The findings suggest that accurate reform of the current DSM scope could help to harmonize the fragmented national Member States policies and thus help businesses to digitally transform.[14] Due to the limited size of publications and the broad scope of the DSM Strategy, the analysis comparatively reviews regulatory techniques already in place. A qualitative analysis of Germany´s national digitalization framework ("*Industrie 4.0*") will complement the research of this paper through insights into political entrepreneur and expert opinions. The analysis will highlight why Member States are digitalized differently, where current legislation remains insufficient and suggest an urgency of policy harmonization to ensure that less developed countries get a fair chance to catch up. Additionally, the case of SAP Societas Europea (SAP SE) will provide an overview over which challenges and obstacles businesses face when transforming digitally under the current EU regulation. The in-depth interviews with employees of the German software company SAP will reveal, that the DSM strategy misses to capture regulatory challenges arising from the application of new advanced technologies, such as intermediate services. By mapping findings of the case study with the current scope of the DSM strategy, the thesis will provide a policy recommendation that concretely sets out in which areas digital legislation can be reformed to help businesses across the EU to transform digitally and will make a suggestion on how critical regulatory gaps could be closed.[15]

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[10] McKinsey (2016) "Digital Europe: Realizing the continents potential" accessed April 12, 2020, https://www.mckinsey.com/business-functions/mckinsey-digital/our-insights/digital-europe-realizing-the-continents-potential

[11] Pachuca-Smulska B. (2020) "The Impact of Regulatory Techniques."

[12] Fenwick M. et. al. (2019) "The End of `Corporate´ Governance."

[13] Pachuca-Smulska B. (2020) "The Impact of Regulatory Techniques."

[14] McKinsey (2020) "Digital Europe: Realizing the continents potential."

[15] See Fenwick M. et. al. (2019) "The End of `Corporate´ Governance."

## 2. Conceptual Framework

Through the analysis, I want to investigate how effectively the European regulatory framework captures the challenges businesses face due to digitalization, and investigate the following research problem:

> *"How well does the European Digital Single Market Strategy and the Industry 4.0 Framework afford Digitalization Transformation? A Case Study of SAP SE."*

To answer my research problem, I have also developed a set of sub-questions that provide structure to the different chapters of the thesis and aim to help in answering the above-mentioned research question.

a. What is meant by digital transformation (DT) and which changes does it require for the European business sector?

b. What is the European Digital Single Market Strategy (DSM) and its scope?

c. Why was the German national framework of Industry 4.0 developed and what does it entail?

d. How do the DSM and Industry 4.0 afford DT?

e. In which way did the DSM and Industry 4.0 encourage SAP SE transformation?

Coherent with the framework of the qualitative analysis, the sub-questions in **Table 1** below are linked to certain rationales that further specify the research problem.

**Table 1: Sub-Questions to be Addressed**

| Sub-Questions | Rationale |
|---|---|
| Q1: What is meant by Digital Transformation (DT) and which changes does it require for the European business sector? | Seeks to understand the ***context*** of DT |
| Q2: What is the European Digital Single Market Strategy (DSM) and its scope? | Seeks to understand the ***content*** of the DSM |
| Q3: Why was the German national framework of Industry 4.0 developed and what does it entail? | Seeks to understand the ***content*** of the framework Industry 4.0 |
| Q4: How do the DSM and Industry 4.0 afford DT? | Seeks to understand the ***scope*** of the DSM and the Industry 4.0 framework. |
| Q5: In which way did the DSM and Industry 4.0 encourage SAP SE transformation? | Seeks to understand DT from a practical lens and explores its ***strategy***, ***content*** and ***process*** |

*Resource: Own Illustration*

## 2.1 Research Method

This chapter will proceed to explain the research design and thought process behind this thesis. The research design is a general plan that helps answering the research question.[16] The design thus relates to the conceptual research problem for relevant and practicable empirical research as presented in the previous section.[17] The chapter will start with a presentation of the research design and describe the procedures that were used to conduct the analysis. Additionally, a data collection, data analysis, evaluation of research methods and ethical considerations are provided.[18] The nature of research is either exploratory, descriptive or explanatory, or a combination of all. Exploratory research involves asking open questions to discover new insights into the topic investigated. While a problem studied in descriptive research is structured and well understood, the purpose of such research is to gain an accurate profile of events, persons or situations. Therefore, explanatory research is about investigating a situation or problem to explain the relationship between different variables. After searching for literature covering the topic, it became obvious that the analysis concerns a rather new research field and consequently not a lot of scientists have examined the research question before.[19] Although plenty of literature covers how digitalization effects businesses DT, there is only limited coverage regarding the role of EU and German national regulators understanding of it. Therefore, only limited literature could be found that determines the scope and affordance of the DSM and the German Industry 4.0 framework for businesses DT. Hence, an exploratory design was chosen for the analysis, because it seems to be the most appropriate method when attempting to get new insights or clarify the understanding of a research problem. In this thesis, the exploratory design is expected to help gaining insights on how digitalization was dealt with in the regulatory frameworks on European level and German national level.[20] A benefit of using this type of research allows investigations through an open approach for data collection and analysis and an opportunity to present and receive new knowledge about the topic.[21]

Furthermore, it allows to establish several operational definitions of DT dimensions.[22] When the research design was chosen, an evaluation was made to the extent of which the study is concerned with theory testing and theory building. This choice raised an essential question regarding two different methods: deductive or inductive reasoning. A deductive approach calls the researcher to have a logical process of deriving at a conclusion from a known premise or something known as accurate. The inductive approach on the contrary, is a systematic process of establishing a general proposition based on observation or particular facts.[23] Nevertheless, it can be challenging to achieve a clean deductive approach. Thus, there is a third approach to theory development, which is called abductive reasoning. This approach presents a midway between deductive and inductive reasoning. Abductive reasoning generally refers to a circular research process where scientists examine both existing literature and empirical surroundings simultaneously to create a context-sensitive theory or to discover a theory that fits empirical surroundings.[24] This analysis will move back and forth between theory and empirical evidence as more and more information and knowledge about the research subject is gained. Thereafter, this approach seems most suitable for the purpose of the analysis, because during the interviews conducted, new information appeared that were relevant to the research problem and had not yet been addressed in-depth by academia. The researcher has tried to remain objective throughout the interviewing process. As the phenomenon of business DT was researched at a specific time, the term of time horizon allowed to constrain the special circumstances of the COVID-19 pandemic that caused some complications for the research. Throughout the chapters a brief outline of the development and impact of digitalization in Member States, as well as an overlook of existing national and regional digitalization strategies will be provided. Further, the analysis introduces the case study of SAP to provide for two main aspects: first, an example of how the implementation of new technologies transforms a company with effects to the external market; secondly, the research will investigate which challenges a company faces in digital transition that might not be captured accurately enough by the current EU framework. Hence, the first part of the thesis will consist of a qualitative literature, policy and legislation analysis in which each chapter forms the theoretical basis for the following. A second part then proceeds to present empirical findings of the conducted expert interviews. Finally, a conclusion pinpoints regulatory challenges found in the DSM by introducing a policy recommendation. Subsequently, the conclusion will discuss whether there is a need for further research.

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[16] Saunders M.N., Lewis P. and Thornhill A. (2015) *"Research Methods for Business Students."* (7th ed.) Harlow, United Kingdom: Pearson Education Limited.

[17] Gauri P.N. and Gronhaug K. (2005) *"Research Methods in Business Studies: A Practical Guide."* (3rd ed.) Harlow, United Kingdom: Pearson Education.

[18] See Bui Y.N. (2014) *"How to Write a Master´s Thesis."* (2nd ed.) Thousand Oaks, California, USA: SAGE Publications.

[19] Cooper D.R. and Schindler P.S. (2014) *"Business research methods."* (12th ed.) Singapore: McGraw-Hill.

[20] Saunders M.N. et. al. (2015) "Research Methods for Business Students."

[21] Saunders M.N. et. al. (2015) "Research Methods for Business Students."

[22] Cooper D.R. and Schindler P.S. (2014) "Business research methods."

[23] Ibd.

[24] Polsa P. (2013) "The crossover-dialog approach: The importance of multiple methods for international business." *Journal of Business Research* 66**(3):** 288-297.

### 2.1.1 Data Approach

To answer the research question, it was necessary to obtain data from the selected case study[25] and for the purpose of the analysis a qualitative approach seemed most favorable to first gain general understanding of the topic and knowledge of underlying factors that affect business DT. The research design additionally enabled to evoke responses that were meaningful and unanticipated, as well as rich and explanatory. Furthermore, a qualitative based approach provided room for closeness between respondents and the researcher.[26] Thus, the approach of data collection was based on both, primary and secondary sources: literature analysis and personal interviews.[27] Meanwhile the primary source of interviews helped to gather information about respondent´s self-understanding and personal thoughts on the topic, the secondary data was collected from web pages of the European Commission, Court of Justice and European Parliament to get information about the regulatory framework regarding digitalization in the EU, from the *Bundesverfassungsgericht* and German Ministry regarding national legislation to digitally transform the German economy and from web pages and articles to get information about the industry the business of SAP operates in.

### 2.1.2 Case Study

To investigate the research questions the research conducted a case study from the German software company SAP SE to investigate business practitioners' expert opinions on how well the DSM and the Industry 4.0 framework capture DT. The name SAP stands for "*Systeme, Applikationen, Produkte und Datenverarbeitung"* and SE determines its status as *Societas Europea*. As a corporation of multinational scale, it produces enterprise software (mainly so-called Enterprise Resource Planning software, including cloud service) to manage business operations and customer relations for around 425.000 customers in over 180 countries worldwide. Previously, SAP specialized in so-called Enterprise Resource Planning (ERP) software. But with the changing digital landscape, customers increasingly demanded end-to-end processes and solutions for software, data banks, analysis and intelligent technologies for experience management. Thus, SAP specialized in the growing field of cloud computing and digitally transformed its service and became one of the world leading companies offering cloud solutions.[28] It is believed that the chosen case study is most favorable for the analysis, because it offers a more profound understanding of the topic with practical insights into experts' opinion that enable more knowledge of business and regulatory challenges related to DT.[29] As there are no preselected or close-end answers available in related academia that could have helped to solve the research problem, the method of qualitative research suggests the use of interrogative strategies as best fit.[30] Qualitative research further allowed to investigate into the real-life phenomenon of DT within the environmental context of the EU´s digital single market that the business of SAP as case study operates in.[31] The DT dimensions found in the case study have been compared with aspects identified in the qualitative literature analysis of the DSM and the Industry 4.0 framework, in order to investigate whether the European and German regulatory frameworks capture all aspects of DT – or which legal grey zones may appear to need further regulation or reformations. Since SAP very recently introduced cloud service into its product portfolio, an internal DT process was fostered, and the empirical findings of the thesis suggest that there are certain regulatory gaps in the area of data security, storage and law awareness that present legal challenges to DT.

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[25] Saunders M.N. et. al. (2015) "Research Methods for Business Students."

[26] Gibbs G. (2018) *"Analyzing qualitative data."* (2nd ed.) London, United Kingdom: SAGE.

[27] Ghauri P.N. and Gronhaug K. (2005) *"Research Methods in Business Studies: A Practical Guide."* (3rd ed.) Harlow, United Kingdom: Pearson Education.

### 2.1.3 Expert Interviews

In order to analyze and test the research question in a scientific manner, the findings of the literature analysis were confirmed in several expert interviews with business practitioners, political entrepreneurs and an academic. The method of interviews was chosen, because it provided valid and reliable data relevant to the research question and objective of the thesis. Additionally, it helped to gain extensive information about individual perspectives concerning the research topic[32] and to comparatively investigate to which extent the DSM and the German national initiative Industry 4.0 afford DT. The reference framework tool that was used throughout the interviews is the Business Model Canvas, developed by Osterwalder and Pinger (2010). The framework includes internal and external business factors that are distributed among four areas of value (internal infrastructure, customer interface, proposition and value formula)[33] and nine building blocks (that will be introduced later on and are provided in **Figure 9** in the appendix) that enabled a comprehensive presentation of the case study. This proposition was chosen because it is the most used one by business entrepreneurs in the private sector when building and applying a strategy plan for business transformation.[34]

In general, interviews can be categorized as structured, semi-structured, or unstructured (in-depth). Since the analysis aims to compare practical insights of challenges and obstacles businesses might face when digitally transforming, major purpose of the data collection was to collect concrete statements through semi-structured interviews. Expert interviews are a specific form of applying semi-structured interviews.[35] This form seemed most suitable, because it enabled to structure the interviews while allowing flexibility and possibilities for participants to express their thoughts freely,[36] as well as to prevent misunderstandings. Furthermore, the structure allowed to ask complex, open questions and additions of follow-up questions.[37] According to Flick (2009), when expert interviews are used, mostly staff members of an organization with a specific experience and knowledge become a target group.[38] Accordingly, and based on the pretest of the qualitative literature analysis (as displayed throughout **Chapter 3, 4** and **5**), six SAP employees that were divided into 4 groups of detected digital business model structures (namely people, process, products, and European single market ecosystem dimensions as displayed in **Figure 10** in the appendix and introduced within **Chapter 6**). For the purpose of research and to test the significance of the results with insights into the business structure of a similar company, another interview with a business expert from the company Siemens was conducted. Additionally, in order to allow for a more holistic view on how well the framework of Industry 4.0 and the DSM afford DT in the European economy, a political entrepreneur working as politician and member of the German Bundestag was interviewed to provide in-depth insights into the German national Industry 4.0 framework and into political expert opinions on DT. Furthermore, to allow an overlook of how well business DT is afforded by the DSM, one academic expert in the field of digitalization was interviewed to provide an overlook of the European perspective on DT. Altogether, it was considered that all interviewees have professional experience and insider views into corporate structures of the business world, the German national Industry 4.0 framework and the EU single market structure and thus relevant to the research question.[39] A total of 9 expert interviews fitting the format of digital skype interviews were accordingly conducted and transcripts of them are displayed within the appendix.

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[28] SAP (2019) "Über SAP SE," accessed July 11, 2020, https://www.sap.com/corporate/de.html

[29] Mack N., Woodsong C., McQueen K.M., Guest G. and Namey E. (2005) "Qualitative Research Methods: A Data Collector´s Field Guide." North Carolina, USA: Family Health International.

[30] Barnham C. (2015) "Quantitative and qualitative research." *Journal of Marketing Research* 57(**6**): 837-854.

[31] Ridder H. (2017) "The theory contributing of case study research designs." *Business Research* **10**: 281-305.

[32] Saunders M.N. et. al. (2015) "Research Methods for Business Students."

[33] Osterwalder A., Pigneur Y. and Tucci C.L. (2005) "Clarifying business models: Origins, present and future of the concept." *Communications of the association for Information Systems* 16(**1**): 1-28.

[34] Chesbrough H. (2007) "Business model innovation: it´s not just about technology anymore." *Strategy and Leadership* 35(**6**): 12-17.

[35] Hahne G. (2014) "External Quality Control and its Impacts on Quality in Auditing Companies with Focus on Small Medium-sized Audit Companies." *Economics World* 2(**3**): 169-179.

[36] Cooper D.R. and Schindler P.S. (2014) "Business research methods."

### 2.1.4 Completion of the Interviews

The expert interviews have been conducted as follows: The interview partners were sent a short overview about the topic via e-mail in preparation for the interview and were informed about the estimated length. However, the interview questions still aimed to find ad hoc answers to achieve more detailed and broader outcomes. The interviews took between 20-40 minutes and were conducted through skype video call due to the COVID-19 situation. During the interviews, the answers were recorded, and the audio files were then transformed into Word-files to ensure the highest level of anonymity possible.[40] After the interviews, findings were transcribed and anonymized to ensure confidentiality of sensitive business and political areas. Additionally, the scoping of the results in anonymous form was communicated upfront to the participants, in order to ensure that they would feel confident enough to share their honest opinions. A careful analysis of both methods, the qualitative literature analysis and the semi-structured interviews with experts from different fields of the private and public sector thus aimed to ensure generalizability of the findings.

### 2.1.5 Data Analysis

The term “thematic analysis” is often used in qualitative research and outlined in the following five steps: compiling, disassembling, reassembling, interpreting and concluding. The analysis of the data conducted used this process of thematic analysis based on the work of Castleberry and Nolen (2018), in which a template consists of a list of codes or categories that express the themes reported from the data collection.[41] This form was chosen because it provided an option to structure the qualitative data conducted while allowing a flexible route for the analysis.[42] The findings were then divided into the four DT categories detected: process, customer, product, and ecosystem of the European digital single market dimensions (that are introduced as empirical findings of the case study later on and displayed in **Figure 10** in the appendix). The divisions of the dimensions represented the first step for finding an answer to the research question, because data compiling means that data from the interviews gets transcribed so that it can easily be used for an analysis.[43] While this in general helps the researcher to achieve closeness to the data, a coherent transcription process can also help to gain control of the raw data in the most achievable objective way possible.[44] Next, the compiled data was disassembled which implied taking apart the information and develop meaningful categories. For this, the analysis processed the raw data by gradually converting it into usable data through the identification of ideas and dimensions that are in connection to each other.[45] This second step was based on the framework of Gioia et. al., (2013),[46] according to which the interview outcomes were structured into second-order themes – so called specific "core" categories as overarching dimensions for the analysis.[47] For the research purpose this step of categorizing the data needed an open approach[48] and provided key components to ensure rigor for the qualitative research.[49] The core categories were thus based – though not restricted to – the theoretical background found in the preliminary literature analysis, by applying open coding interview transcriptions.[50] The second order themes, due to their direct relevance while addressing the study´s research questions, rather represented a synthesis of dimensions that emerged from the comparison of the DSM and Industry 4.0 framework with findings of DT aspects detected in the case study of SAP.

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[37] Saunders M.N. et. al. (2015) “Research Methods for Business Students.”

[38] Flick U. (2009) *“An introduction to qualitative research.”* 4th ed. London: SAGE.

[39] Hahne G. (2014) “External Quality Control.”

[40] Ibd.

[41] Castleberry A. and Nolen A. (2018) “Thematic analysis of qualitative research data: Is it as easy as it sounds?” *Currents in Pharmacy Teaching and Learning* 10**(6)**: 807-815.

In a third step the categories got reassembled into context with each other to develop the overall DT theme necessary to answer the research question. A theme can be understood as a concept that addresses relevant data in relation to the research question and also represents some level of patterned response or special meaning found within the data set. This step allowed to structure and reduce the data.[51] A final step of the data analysis then consisted of the interpreting as the crucial stage in the research work, where logical conclusions got drawn that also became part of **Chapter 6.1**, in which the empirical findings got contrasted with remaining open questions that fell out of the scope of this research. Additionally, direct citations of the expert interviews got used throughout the thesis, to provide evidence that the findings of the qualitative literature analysis and the case study findings complement each other. As a last step of the thematic analysis a final chapter concluded with a discussion of the empirical findings (see **Chapter 6.2**) by considering the quality of data material[52] provided by the thesis based on recommendations of Saunders et. al. (2015) concerning reliability and validity for research.[53] As strategic decision processes affect the future and stability of any company and organization,[54] business managers continuously strive to adapt to the changing ecosystem of the EU single market and according to the findings, a firm set up is one of the main drivers that determines businesses success or failure for DT. Therefore, the mapping of the results not only utilizes empirical findings, but also offers practical DT dimensions that may be used by practitioners in the future as tools to ensure strategic decision making while controlling risk and increasing shareholder wealth when leading businesses through DT.[55]

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[42] Saunders M.N. et. al. (2015) "Research Methods for Business Students."

[43] Castleberry A. and Nolen A. (2018) "Thematic analysis of qualitative research data: Is it as easy as it sounds?"

[44] Saunders M.N. et. al. (2015) "Research Methods for Business Students."

[45] Castleberry A. and Nolen A. (2018) "Thematic analysis of qualitative research data: Is it as easy as it sounds?"

[46] Gioa D.A., Corley K.G. and Hamilton A.L. (2013) *"Seeking Qualitative Rigor in Inductive Research: Notes on the Gioa Methodology."* Sage Publications.

[47] Yin R.K. (2014) *"Case study research. Design and methods."* 5th ed. Thousand Oaks, CA: Sage.

[48] Saunders M.N. et. al. (2015) "Research Methods for Business Students."

[49] Tracy S.K. (2010) *"Qualitative Quality: Eight `Big-Tent´ Criteria for Excellent Qualitative Research."* Sage Publications.

[50] Corbin J.M. and Strauss A. (1990) "Grounded theory research: Procedures, canons, and evaluative criteria." *Qualitative Sociology* **13**: 03-21.

[51] Castleberry A. and Nolen A. (2018) "Thematic analysis of qualitative research data: Is it as easy as it sounds?"

[52] Ibd.

[53] Saunders M.N. et. al. (2015) "Research Methods for Business Students."

[54] Sibony O., Lovallo D. and Powell T.C. (2017) "Behavioral strategy and the strategic decision architecture of the firm." *California Management Review* **59**: 5-21.

#### *2.1.5.1 Reliability*

Reliability refers to the stability of the measure and involves to what extent the researcher has influenced the data results.[56] Thus, reliability concerns the ability of another researcher to get the same analysis results when using the same research method. In research, findings are generally considered as reliable, if the outcome of the measuring process is replicable. A potential threat to reliability may occur between respondents and interviewer through body language, cadences and spontaneous additional questions, or if respondents wish to present themselves in a good light. In order to avoid any of these issues, the interviews had no leading question and gave no expression about the researcher's opinions or desired outcome before or during the interview. Rather, the researcher was aware of personal biases and anonymity was emphasized. The interview's audio recordings were additionally used to reinsure informational correctness. Respondents' tapes got stored safely in a private cloud, which only the researcher has access to, and which will be deleted after the submission of the paper to ensure full data security. Therefore, it is believed that the data collected is reliable and correct under the given circumstances.[57] However, despite of these considerations and although the used literature was analyzed, data gathered, prepared, processed, and analyzed under the advice of the thesis supervisor, it may be difficult or even impossible to replicate qualitative findings in the same way.[58]

#### *2.1.5.2 Validity*

Validity refers to how well data material answers a research question. There are two types of validity: internal and external. While the internal form concerns whether results are perceived as correct and may be influenced by researcher´s interpretation, external validity is about the extent to which findings can be generalized to other relevant contexts. In this paper, the internal validity concerns the insights gained into significant factors of how well the DSM and the Industry 4.0 framework afford DT. Since personal opinion may affect data collection and analysis, the researcher has tried to be as objective as possible to secure internal validity. Nonetheless, because of the nature and detailed scope of this study, it may be challenging to generalize the findings to the entire European business sector. However, the empirical findings are still relevant for other contexts. For example, it is expected that DT of other businesses will be similar to the findings detected in the case study of SAP. Thus, although the external validity of the thesis may be regarded as low, it is not believed to be a problem due to approach and purpose of the research.[59]

#### *2.1.5.3 Ethical Considerations*

It is crucial to be conscious of the ethical challenges that must be addressed to maintain a high level of research ethics.[60] It was aimed to satisfy ethical principles by treating all interview participants respectful and equal.[61] Thereafter, the data analysis was conducted and analyzed with objectivity and integrity. As concession and notification obligation are crucial aspects of research ethics, participants were informed about research purpose and promised anonymization. As written consent can both protect the researcher and participant, all participant had to sign a consent form, which ensured their participation was voluntary and that they had a right to withdraw from the study at any time. Another requirement in research ethics concerns privacy, which addresses possibilities to identify individuals from the data or how sensitive (i.e. information about religion) and private the gathered information is. Confidential information however was irrelevant for answering the research question and consequently, the information gathered from the respondents did not deal with any sensitive or private matter.[62] Moreover, participant's anonymity was kept throughout the entire process of interview transcription and data analysis.[63] For the purpose of the research it was essential to interpret what the interview participants intended and wished to express during the interviews, because a final aspect for research ethics is the requirement for the correct data presentation. Here, it was tried to emphasize all aspects of the data collection equally and avoid any strategic presentation or withholding of others. Therefore, it is believed that adequate ethical considerations have been met.[64]

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[55] Länsiluoto A., Jokippi A. and Eklund T. (2016) "Internal control effectiveness – a clustering approach." *Managerial Auditing Journal* 31: 5-34.

[56] Ghauri P.N. and Gronhaug K. (2005) "Research Methods in Business Studies: A Practical Guide."

[57] See Saunders M.N. et. al. (2015) "Research Methods for Business Students."

[58] Bell E., Bryman A. and Harley B (2018) "Business Research Methods." (5th ed.) Oxford, United Kingdom: Oxford University Press.

[59] Saunders M.N. et. al. (2015) "Research Methods for Business Students."

[60] Cooper D.R. and Schindler P.S. (2014) "Business research methods."

# 3 The Legal Dimension of the European Digital Single Market Strategy

In response to challenges businesses face when adopting new production solutions and technologies, most Member State governments have made it a priority to adopt large-scale policies aimed to increase productivity and competitiveness. Although national authorities are aware of the policies of their peers, a systematic and holistic cooperation at European level seems to be missing. Thus, this chapter will introduce the analysis with describing how Member States policies differ in their policy design, funding approaches and implementation strategies concerning digitalization.[65]

## 3.1 From the Single Market to the Digital Market

The Treaty of the European Union (TEU) states that the Union is founded on certain shared values in which pluralism, non-discrimination, justice, solidarity, tolerance and equality prevail.[66] Among other things, the EU´s aim is to promote the well-being of its European Union (EU) citizens. On the one hand as mentioned politically, by ensuring certain shared rights and values. While on the other hand economically, by establishing an internal market and ensure an open market economy with free competition and promote sustainable development based on balanced economic growth.[67] Accordingly, from the very beginning of the construction of a united Europe, priority was given to the internal market. Each stage of integrating more countries to the EU was accompanied by subsequent regulations (such applications of the principles of mutual reciprocation[68] of policy features and principles of non-discrimination[69]) aimed at harmonizing the legislation of Member States and merging their markets into one economic area.[70] Promoting economic efficiencies as part of the application of EU regulation thus echoes the EU´s philosophy of neoclassical and neoliberal economies. Important, however, while of central significance, efficiency considerations are entwined with the promotion of digitalizing Member States economies.[71] Therefore, based on the four freedoms as policy aim introduced by the European Single Act in 1992 (namely freedom of movement for goods, capital, workers, establishment and services),[72] Europe´s internal market first developed into a single market before from 2015 onwards transforming into its current form of the digital single market with varying Member States economies.[73] Within this context of the digital economy, the EU Commission issued the Digital Single Market Strategy (hereafter referred to as DSM) in May 2015, aiming to take steps `towards a connected digital single market´, in an attempt to harmonize the varying economies of Member States and estimated a completion of the market to contribute up to €415 billion per year to the EU economy. As discussed it will be discussed in the next chapter, initially the theme of the DSM was planned to bring down barriers to trade and unlock online opportunities with the aim to move the EU from 28 national markets towards one integrated single one.[74] In 2005, when analyzing results of the Lisbon Strategy, the European Commission noted, that the functioning of the single market as succeeding in building up such a common market is hampered by the late enforcement of joint measures regarding Member States' industry modernizations that have resulted in diverging national jurisdictions. Accordingly, EU legislators introduced several domains on EU level that aimed to start a harmonization of the fragmented character of Member States' legislative and fiscal systems.[75]

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[61] Roth W.M. (2005) "Ethics as social practice: Introducing the debate on qualitative research and ethics." *Forum Qualitative Social Research* 6(**1**): 01-17.

[62] Oliver P. (2010) *"A student´s guide to research ethics."* United Kingdom: McGraw-Hill Education.

[63] Diener E. and Crandall R. (1978) *"Ethics in social and behavioral research."* Chicago: University Press.

[64] See Saunders M.N. et. al. (2015) "Research Methods for Business Students."

[65] Ezrachi A. (2018) "EU Competition Law Goals and The Digital Economy."

[66] Consolidated version of the Treaty on European Union (TFEU) "TITLE I: COMMON PROVISIONS - Article 2," accessed July 19, 2020, https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:12008M002:EN:HTML

[67] Ezrachi A. (2018) "EU Competition Law Goals and The Digital Economy."

In 2015, the European Commission analyzed the advantages of the digital area and implemented the European digital market (hereafter referred to as DM) to foster stipulations in economic strategies such as labor force recovery, economic growth and stimulating competitiveness and applying the new business opportunities offered by digitalization. The DM strategy undertakes reforms in all areas at both, technical and legislative level, including copyright rules, updating the rules on electronic commerce and protection of data.[76] A major goal of the new strategy is to expand the EU' digital economy, remove regulatory barriers and help all industrial sectors to integrate new technologies through transition to a smart industrial system - so called "*Industry 4.0*" initiatives that will be analyzed in more detail in the following parts of the thesis.[77] Within its current form, the DSM integrates agreement of European leaders and members of the EU Parliament to invest and support facilitations of EU businesses in terms of access to finance, technology and knowledge exchange.[78] As the EU relies on many global sectors - ranging from manufacturing, automotive, chemical industry to energy, the need for businesses to be interoperable to new technologies gains increasing recognition as being essential for EU competitiveness.[79]

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[68] European Parliament (2018) "Briefing. EU Legislation in Progress. Mutual recognition of goods," accesed July 19, 2020, https://www.europarl.europa.eu/RegData/etudes/BRIE/2018/614671/EPRS_BRI(2018)614671_EN.pdf

[69] Eurofond (2016) "Non-discrimination principle," accessed July 19, 2020, https://www.eurofound.europa.eu/observatories/eurwork/industrial-relations-dictionary/non-discrimination-principle

[70] Monti M. (2010) "A New Strategy for the Single Market at the Service of Europe´s Economy and Society. Report to the President of the European Commission José Manuel Barroso" accessed May 07, 2020, http://cms.horus.be/files/99931/Newsletter/MM%201%20-%20Single-Market-New-Strategy-Monti-Report-09.05.10.pdf

[71] Ezrachi A. (2018) "EU Competition Law Goals and The Digital Economy."

[72] Euro Lexicon (2018) "The Single European Act," accessed July 19, 2020, https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=LEGISSUM:xy0027&from=EN

[73] Monti M. (2010) "A New Strategy for the Single Market at the Service of Europe´s Economy and Society."

[74] Frosio G.F. (2017) "Reforming Intermediary Liability in the Platform Economy: A European Digital Single Market Strategy." *Northern University Law Review* 112(**251**): 19-46.

[75] Lucian P. (2018) "A few considerations regarding the strategy for the digital single market."

[76] Ibd.

[77] Commission (2016) "Digitizing European Industry – catalogue of initiatives."

[78] Lucian P. (2018) "A few considerations regarding the strategy for the digital single market."

> Andrus Ansip, Vice-President EU Digital Single Market (2015): *"Innovative businesses must be helped to grow across the EU, not remain locked into their home market. This will be an uphill struggle all the way, but we need an ambitious start. Europe should benefit fully from the digital age: better services, more participation and new jobs."*[80]

As digitalization may be seen as a two-sided sword – somehow like a goldmine but also a challenge, the Commission (among other standards) has enacted data protection legislation within the DSM framework which also perceives parts of cloud computing. In order to unlock the potential of such new technology like cloud service however, a correct framework is necessary to let businesses, organizations, public service and EU citizens across Europe flourish and benefit from digitalization. Such focal considerations set out priority areas for political action that the EU aims to focus on within the DSM.[81] To achieve strategy confidence, the Commission also acknowledged that data security and electronic government became necessary and in this context resulting in a new legislative framework for e-governance. Throughout 2016-2017 the Union thus took important steps by eliminating roaming tariffs, enforcing data protection, enabling cross-border portability of online content and agreements regarding the de-blocking of electronic content within the scope of the DSM. Furthermore, within the years to come, the European DM is planned to become a stimulus for economic development which may pave the way to implement and use more new and advanced technologies.[82] EU institutions thus concentrate on the process of establishing a DM with the presumption of a better industrial and advanced future. Including considerations of general strategies for goal achieving, provisions of faster internet and enablement of the interoperative applications with broadband access attainable equally for all EU citizens.[83] Thus, the DM predicts to establish a stable digital economy with major marketing focus on three basic components: (a) promotion of digital readiness as primary policy driving force to stimulate economic impact and digital content, (b) building of a digital infrastructure within Member States, (c) focus on the impact of a well-functioning European market by encouraging provisions of innovation in the service field of European businesses through the DSM.[84] Additionally, the DSM project covers initiatives related to the role of platforms, which the Commission highlighted with the entry into operation of the Online Dispute Resolution Platform and review of the Consumer Protection Cooperation Regulation (EC) 2006/2004.[85]

Another new aspect of the online environment that legislators have come to realize within the DSM framework are new possibilities for consumption and digital development of Member States' economies.[86] In order to progress towards an integrated DM, the Commission focused the DSM strategy thus on the following areas: (1) cross-border access to content, (2) data-mining, (3) civil enforcement, (4) the role of IPS.[87] In May 2016 then, the Directive for the DM entered into force that ensured the observance of criminal law for personal data processions and started to get transported to Member States' national legislation. Additionally, the European Competitiveness Council proposed a regulation to prohibit unjustified geolocation between

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[79] Commission (2016) "Digitizing European Industry – catalogue of initiatives."

[80] Ibd.

[81] Ibd.

[82] Pachuca-Smulska B. (2020) "The Impact of Regulatory Techniques."

[83] Thelle M.H. and Jespersen S.T. (2010) "*The Economic Impact of a European Digital Single Market*." Final Report March 2010. Copenhagen: European Policy Centre.

[84] Castells M. (2009) "*Communication Power.*" New York: Oxford University Press.

[85] Regulation (EC) No 2006/2004 of the European Parliament and of the Council of 27 October 2004 on cooperation between national authorities responsible for the enforcement of consumer protection laws (the Regulation on consumer protection cooperation). *OJ L 364, 9.12.2004*

[86] Havu K. (2017) "The EU Digital Single Market from a Consumer Standpoint: How do promises meet means?"

[87] Frosio G.F. (2017) "Reforming Intermediary Liability in the Platform Economy."

Member States as objective to prevent discrimination of consumers and societies about prices and products in the DM. Considering the multiple benefits of the digital single market, the European Council in 2017 continued in this vein by adopting new rules on the portability of digital services. This measure along with the elimination of roaming taxes can be regarded as effort of EU policymakers to further consolidate the DM. However, although the digital agenda is at the core of the DSM, Member States have only started the internal processes for identifying national properties and making own contributions to launch and enforce the DSM.[88] Accordingly, Mariya Gabriel – current Commissioner for Digital Economy and Society and responsible for the systematic implementation of the DSM package, plans to further mobilize stakeholders to supports future coordination of EU and national initiatives.[89]

One of the major initiatives of the DSM aims to accurately address needs of EU citizens and businesses in the Member States by creating the DM as single digital gateway.[90] Thus, at heart of the DSM agenda to maintain EU competitiveness was the new EU budget plan "Horizon Europe." The plan includes strategic priorities and aims to contribute to tackle global challenges, including the Sustainable Development Goals as set out by the United Nations. With a success rate between 6% to 10%, Italy, Spain and the United Kingdom (prior to Brexit) represented the highest beneficiaries of Horizon Europe and provide evidence for the budget plans success. Thus, the Commission decided to continue with similar DSM reforms and set out new priority for businesses as a crucial source of employment and innovation in the digital field that are to start from 2020 onwards. Included is a new Multiannual Financial Framework whose overall budget of €25 billion will offer financial and technical support for the pursuit of priority reforms and a European Investment Stabilization Function (ISF), which will help to maintain investment levels in the event of large asymmetric shocks. The framework is planned to provide extra financial support when public finances become stretched and priority investments must be maintained for EU Member States. In an economic sense, EU decision-makers decided for this budget with clear focus on performance that is easy to monitor and in alignment with Union priorities. Viewed from a political perspective however, this aims to unite fragmented EU funding sources in an integrated framework through the investment fund and increased flexibility to ensure financial instruments to be available to respond to emergencies, might contribute to a more stable Euro area. Such improvements, in turn represents a precondition for economic growth, investment and social fairness as emphasized in a roadmap approved in December 2017 for deepening Europe´s Economic and Monetary Union. The new budget needs new investment, for which the EU has planned to cover only 20% from redeployment and savings and 80% from fresh money. The proposed basket of new resources includes a call rate from Common Consolidated Corporate Tax Base, revenues from the Emission Trading System and national contributions from the Member States.[91] Further, Europe needs substantial investment to spread new technologies and cybersecurity solutions. As its workforce still lacks advanced digital skills which affects the labor market and more generally the European economy, the EU institutions need to focus on strengthening the EU's industrial policy and digitalization theme as a great opportunity for reindustrializing Europe. In order to disseminate digital skills, trainings and education are other essential components to develop competitive advantages vis-à-vis other markets.[92]

In the field of commercial policy and in the vein of Germany´s role model, the aim also lies in the establishment of new valuable partnerships and cooperation with both, EU Member States and third countries.[93] By focusing on market feasibility,[94] EU legislators implement additional strategies such as the “Digital Europe Program” that includes a digital chapter for the next Multiannual Financial Framework[95] and a long-term budget of €1,135 billion in commitments (equivalent to 1.11% of the EU27´s gross national income (GNI)) within the €8.2 billion for the new EU financial budget period 2021-2027.[96] Through implementation of the new budget, the EU expects to play a greater role in providing security by responding to challenges exposed by digitalization, Member State´s fragmentation and the sizeable budget gap Brexit will leave to the EU. As it will be discussed later, some Member States do so with greater ambitions, while others seem to make slower progress. Thus, a link to theoretical knowledge about DT in Member States’ private sectors seems missing[97] and it remains challenging for businesses to know how suitable and reliable existing regulation and information is for their DT.[98]

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[88] Lucian P. (2018) "A few considerations regarding the strategy for the digital single market."

[89] Tsekeris C. (2019) "Surviving and thriving in the Fourth Industrial Revolution."

[90] Pachuca-Smulska B. (2020) "The Impact of Regulatory Techniques."

[91] Commission (2018b) "An ambitious proposal."

[92] Parliament (2018) "Presidency of the Council of the EU, Visit of Heinz Faßmann, Austrian Federal Minister for Education, Science and Research and Margaret Schramböck, Austrian Federal Minister for Economic and Digital Affairs, ITRE Committee, 10 July 2018" accessed April 14, 2020, http://www.europarl.europa.eu/ep-live/en/committees/video?event=20180709-1530-COMMITTEE-ITRE

## 3.2 Digital Single Market Coordination

The challenge for legislators to enforce regulation in the digital age pertains to the difficulties in apprehending the dynamic changes of digitalization. Given this dynamic nature, surroundings of disruptive innovations remain difficult to capture for policymaking.[99] The former Commissioner for Digital Economy and Society, Günther Oettinger communicated the idea for a European Platform of national initiatives at EU level with broad consultations of involved stakeholders at a roundtable in September 2016 as follows:

> Günther H. Oettinger, Commissioner for the Digital Economy and Society (2015):
> “*Europe cannot be at the forefront of the digital revolution with a patchwork of 28 different rules for telecommunications services, copyright, IT security and data protection. We need a European market, which allows new business models to flourish, start-ups to grow and the industry to take advantage of the internet of things. And people have to invest, too – in their IT skills, be it in their job or their leisure time.*”[100]

Among the provision of the new framework was the umbrella function able to ensure the exchange of knowledge and practice for national and regional initiatives. Another integral element became a governance roundtable, at which representatives of Member States´ initiatives, industry leaders, and social partners could meet twice a year at an EU stakeholder forum to exchange with the Commission.[101] The EU Platform of national initiatives, launched in March 2017, is at the core of the above described European and national coordination efforts. The platform emphasizes that digitalization of industries across Europe has built up diverging national initiatives and essentially rolls out investment to ensure commitment of Member States, regions and the private sector to achieve goals of the EU industry digitalization (i.e. in digital sectors such as electronics for automotive, energy markets, security, telecom equipment, laser and sensor technology). Meanwhile still many traditional Member State manufacturing sectors lag behind, which additionally fostered digitalization disparities between EU regions.[102] In order to track digitalization progress and transformation across Europe, the Digital European Industry (DEI) Strategy monitors achievements of Member States' initiatives by a Digital Transformation Monitor (DTM). Regarding the fragmented national and regional initiative landscape at Member States' levels, the DTM detected a need for cooperation and exchange of good practice at EU level. Thus, the Commission targeted the development of Member States' national initiatives and emerging digital growth strategies, development of national digitalization initiatives and gradually started to enhance investment to boost innovation in order to support digitalization of businesses within the DEI framework in November 2017. The DEI is framed by several actions, such as boosting innovation through digital innovation hubs, partnerships for leadership in digital technology value chains and platforms, implementing a governance framework on data, and liability and security in line and aligned with the DSM scope. Nonetheless, the key pillar of the DEI is not harmonization, but modernization of Member States' regulatory frameworks.[103]

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[93] Ibd.

[94] Commission (2018a) “Horizon 2020 in full swing, Three years on key facts and figures 2014-2016” accessed April 14, 2020, https://ec.europe.eu/programmes/horizon2020/sites/horizon2020/files/h2020_threeyearson_a4_horizontal_2018_web.pdf

[95] Commission (2018b) “An ambitious proposal, because it calls on the Member States to put 1,246 billion payments (real cash resources) and 1,279 billion commitments (at the current price) on the plate” accessed April 14, 2020, http://europa.eu/rapid/press-release_IP-18-3570_en.htm

[96] Parliament (2019) “MEPs back proposal to create first EU programme to boost digital investment” accessed April 14, 2020, http://www.europarl.europa.eu/news/en/press-room/20181213IPR21705/meps-back-proposal-to-create-first-eu-programme-to-boost-digital-investment

[97] Gbadegeshin S.A. (2019) “The Effect of Digitalization on the Commercialization Process of High-Technology Companies in the Life Sciences Industry.” *Technology Innovation Management Review* 9(**1**): 49-63.

[98] Parviainen P. et. al. (2017) Tackling the digitalization challenge: How to benefit from digitalization in practice.“

[99] Ezrachi A. (2018) “EU Competition Law Goals and The Digital Economy.”

[100] Ibd.

[101] Ibd.

However, in many cases EU support for digitalization remains divided in innovation programs targeting specific business sector needs and Member States' diverging approaches towards the role of public intervention, which enforces additional divergence in Member States legislation conformity degrees: While some Member States seem to be digital `trend-setters,´ the majority appears as `fast-followers´ that absorb emerging trends that may result in the so-called free rider problem that is considered as market failure, because of inefficient distribution of goods or services that may occur when some citizens are allowed to consume more than their share of the shared resource or pay less than the fair share of costs.[104] First-mover advantage may be gained by Member States by technological leadership or early purchase of digital resources, thus enabling for competitive advantage through control of resources which can be rewarded with profit margins or monopoly-like status.[105] Such trend-setters already have active discussion platforms in place that are driven by national industry and societal organizations. They allocate investments in basic infrastructures, skill development and other important areas of a digital economy. Contrary to fast-follower states, their strategic agenda addresses societal and economic topics, as well as developing technologies that are not yet seen in other Member States. Among some of the most prominent trendsetters are to be named Germany and the Netherlands, while France, the UK and Italy count to some of the smaller ones. The many other Member States that can be categorized as fast followers adapt and follow on topics that have been identified by trendsetters. Delay in adoption of new technologies translates for fast followers in reduced preparedness to the prerequisites of digital industry transformation, because their broader business and research community does not possess enough strong strategic priority areas of global scale able to set a new digital trend.[106] Although the DEI already significantly helped to mobilize Member States' digitalization, more efforts and investments are needed to close gaps between top digital players (*digital trendsetters*) and lower-performing countries (*digital followers*) – including for instance accurate digital education. Summing it up, the DEI has taken a step to anchor the variety of regional efforts and diverging Member States' priorities, because legislative monitoring and reporting on development of existing and developing national digitalization initiatives are key elements to ensure continued DT. However, alignment of national and EU initiatives still happens only gradually but long-term actions need more clear legal targeting in order to complete Europe´s digital transformation successfully.[107]

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[102] Commission (2017a) "Digital Transformation Monitor."

[103] Ibd.

[104] Investopedia (2018) "Understanding the Free Rider Problem," accessed July 19, 2020, https://www.investopedia.com/terms/f/free_rider_problem.asp#:~:text=The%20free%20rider%20problem%20is%20an%20issue%20in%20economics.,fair%20share%20of%20the%20costs.

[105] Schmalensee R. (1981) "Economics of scale and barriers to entry." *Journal of Political Economy* 86(6): 1228-1238.

[106] Commission (2017c) "National Initiatives for Digitizing Industry across the EU," accessed April 22, 2020, https://ec.europa.eu/futurium/en/system/files/ged/national_initiatives_for_digitising_industry_across_the_eu.pdf

### 3.3 Regulatory Techniques for the European Digital Single Market

The EU institutions have used several legislative techniques to build the DM, remove trade barriers, and facilitate administrative and cooperative relations between Member States, from which the three major regulatory objectives will be elaborated in this section. Building on and complementing the many national initiatives for digitizing industry, the Commission plans to further use its policy instruments, financial support, coordination and legislative power to trigger additional investments in all industrial sectors.[108] Two major techniques of the DSM are thus of regulatory nature aiming to harmonize essential rules across the EU and a third group of measures consists of non-regulatory techniques based on action plans, benchmarking of policies and financial support. In the latter area, the Commission issued a DSM revision, which detected a lack of implementing power at EU level. The revision claimed further, that Member States' regulation must be standardized and harmonized, which can only be achieved if further secondary legislation becomes directly applicable for national law.[109]

However, this issue could not be solved, as national authorities implement rules heterogeneously across Member States. Accordingly, fragmentation of national legislation continues to constraint the completion of the DM.[110] For this reason, EU legislators have introduced several institutional and procedural rules within the DSM and in accordance with the TFEU.[111] As online platforms, especially those providing online intermediation services (i.e. cloud services) are key players to the DM,[112] EU legislators adopted a new regulation on online platforms for the DM on the 15th of June, 2017.[113] The new regulation focuses on investments and the pooling of resources for development in technologies and digital industrial platforms. By promoting higher transparency standards, the regulation further provides more legal certainty to ensure fair market conditions across the DM. Included are high-performance cloud infrastructures not solely for private sector use, but also cloud service implementation for science and innovation (i.e. in the health sector). On the one hand, these dynamical developing platforms enable business entrepreneurs *inter alia* to implement innovative ideas for business and to establish contact with customers. On the other hand, online platforms heavily lean on their market position in relation to other market participants. Since many EU businesses cooperate with intermediation services using unfair or unilateral commercial practices, the European Parliament and Council published more detailed provisions within the enforcement of Regulation (EU) 2019/1150 to address this issue of asymmetric bargaining power between business users and online platforms[114] and to enforce uniformity of law across EU Member States through common and clearly defined rules. Article 11 of Regulation (EU) 2019/1150 obliges suppliers of online intermediation service to set up an internal complaint-handling service. This allows users easy access and additionally helps them to identify mediators in accordance with Article 12 of Regulation 2019/1150 to engage in dispute resolution. Although legislation in this area is quite new, some of the solutions introduced are already in place (i.e.

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[107] Ibd.

[108] Commission (2019b) "Shaping Europe´s digital future."

[109] Pachuca-Smulska B. (2020) "The Impact of Regulatory Techniques."

[110] Scharpf F. (1998) *"Negative and Positive Integration in the Political Economy of European Welfare States."* In: Rhodes M. (eds.) The Future of European Welfare. Yves Mény. London: Palgrave Macmillan.

[111] Consolidated version of the Treaty on the Functioning of the European Union. Institutional and financial provisions. Article 228 (ex. Article 195 TEC). *OJ C 202, 7.6.2016*

[112] Adamski D. (2018) "Lost on the digital platform: Europe´s legal travails with the Digital Single Market." *Common Market Law Review* 55(**3**): 719-751.

[113] Resolution (EU) 2016/2276(INI) on online platforms and the digital single market, adopted June 15, 2017.

[114] Regulation (EU) 2019/1150 of the European Parliament and of the Council of 20 June 2019 on promoting fairness and transparency for business users of online intermediation services. *OJ L 186, 11.7.2019*

the legislation on search ranking and data access). Under the regulation, intermediation services must apply clear and widely known conditions. By introducing strong sanctions of nullity, the regulation further aimed to ensure equal treatment among businesses. Non-compliance with the rules laid down in the regulation thus result in market participants voiding contract terms and consequently may increase uncertainty for users.[115] Altogether, the new rules oblige platforms to provide transparent rules for their services, but without imposing a need to disclose algorithm or information that would allow manipulation. Therefore, intermediate services need to define the principles of data collection and use in the course of their business and other related means. In turn however, the current scope of legislation introduced by the regulation does not require Member States to change their internal system in terms of data management, storage, use and disclosure.[116] But, as mentioned in the previous section, the digital economy is based on new technologies and the processing and deployment of data. Thus, EU legislators have come to recognize the wide spectrum of data within the DSM and introduced Directive 2019/1024 to reduce barriers to market and extend the scope for new emerged data types (i.e. data from the transport sector).[117] The directive introduced a principle of minimum harmonization that aims to protect the EU´s legal system against fragmentation of Member States' legislation.[118] Additionally, the Union adopted several recommendations and guidelines to ensure common interpretation according to Art. 263 TFEU about Judicial Review[119] across the Member States and among which the EU-wide enforced Consumer Protection Regulation provides the most relevant regulation. It established a network of national enforcement authorities for EU consumer law, EU copyright rules that aim to address new technologies, consumer behavior and market conditions, and the General Data Protection Regulation (GDPR) to which the thesis – given the context of the research question and chosen case study, will put attention to in the next two sections.[120]

Not all provisions of the current DSM are applicable for Member States, but instead require further implementing measures or interpretation, such as in the case of Art. 8 of the GDPR, under which the consent of minors to use social media is set to the age of 16, but allows Member States to reduce the age individually to 13.[121] Poland considering Art. 8 GDPR adopted the age of 16, Italy the age of 14, while Lithuania, and the United Kingdom decided to set it to 13 years. This illustrates how Member States can choose to regulate on domestic level. Art. 80 of the GDPR on the representation of data subjects illustrates another example for this. Although the article empowers GDPR provisions for the European Data Protection Board and enables Member States to adopt interpretative guidelines despite common EU principles, again national practices across the Member States remain heterogenous. Thus, even in cases of specific legal provisions within the DSM (like the GDPR), it remains difficult to achieve digital regulation uniformity across the Union. This diverging national legislation provides issues for DT when online intermediation services like cloud computing are implemented. In addition to regulation, directives are often used as legislative techniques and set a common goal for the legislation of all EU Member States in each area.[122] Directives bind Member States on either one of two levels: that of minimum or maximum harmonization with EU legislation. Importantly, national measures transposing directives must be binding but not of merely administrative nature. Some directives go beyond just setting goals[123] and may require Member States to establish national regulatory authorities with extensive powers. This is the case for broadcasting sectors, telecommunication, postal and data protection. Nonetheless, every Member State must develop its own rules on how to achieve the objectives set out in European directives and consequently, fragmented national regulatory frameworks are encouraged by the current DSM scope.[124]

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[115] Adamski D. (2018) "Lost on the digital platform: Europe´s legal travails with the Digital Single Market." *Common Market Law Review* 55(**3**): 719-751.

[116] Directive (EU) 2017/1132 of the European Parliament and of the Council of 14 June 2017 relating to certain aspects of company law.

[117] Directive (EU) 2019/1024 of the European Parliament and of the Council of 20 June 2019 on open data and the re-use of public sector information OJ L. No. 172 of 26 June 2019.

[118] Directive (EU) 2003/98 of the European Parliament and of the Council of 17 November 2003 on the re-use of public sector information (OJ L No. 345 of 31 December 2003). (4) Directive 2013/37 on the re-use of public
sector information (OJ L No. 175 of 27 June 2013).

[119] Consolidated version of the Treaty on the Functioning of the European Union - PART SIX: INSTITUTIONAL AND FINANCIAL PROVISIONS - TITLE I: INSTITUTIONAL PROVISIONS - Chapter 1: The institutions - Section 5: The Court of Justice of the European Union - Article 263 (ex Article 230 TEC)

[120] Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data and repealing Directive 95/46/EC (General Data Protection Regulation). *OJ L 119, 4.5.2016*

[121] Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data and repealing Directive 95/46/EC (General Data Protection Regulation). *OJ L 119, 4.5.2016*

### *3.3.1 Regulatory Perspective on the Economics of Data Privacy in the Digital Market*

So far, the analysis stressed that fundamental concerns raised in context of the DM concern collection, generation, analysis and commercial exploitation of data. Due to the stage of the technological revolution, this data has become a new valuable and critical resource for the competitiveness of businesses and entire economies.[125] However, due to the unprecedented amount of data being collected, we see an increasing concern for loss of privacy and individual autonomy due to growing transparency in the online world.[126] Thus, personal data security provides a fundamental EU right enshrined in Art. 8 of the Chapter of Fundamental Rights (CFR) of the EU[127] and in Art. 16(1) of the TFEU.[128] However, as the previous chapter has argued that within the current scope of the DSM, range and meaning of digital protection law concerning data sets appear to be only broadly defined and not strictly specified.[129] Recognizing this regulatory gap and aiming to provide an opportunity to revisit foundations of data protection law, EU legislators recently enforced the reform of the EU Data Protection Directive with the GDPR. So, after its introduction, the GDPR enforced several regulatory innovations for the DM. According to Art. 5 for instance, the GDPR requires that personal data in the EU must be:

(a) Processed in accordance to EU law and in a transparent manner (relating to the concepts of `lawfulness, fairness and transparency´ laid down by EU law).
(b) Collected only for explicit and legitimate purposes and not unnecessarily further processed (thereby introducing the principle of `purpose limitation´).
(c) Adequate, limited and relevant data proceedings (in an attempt to achieve `data minimization´).
(d) Accurate and where needed kept up to date (relating to the concept of `accuracy´).
(e) Kept in a form that permits the identification of data subjects for no longer than necessary and in a purpose, which respects the way in which personal data is processed (attempting to achieve `data storage limitation´).

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[122] Directive from Article 288 of the consolidated version of the Treaty on the Functioning of the European Union (TFEU), OJ C No. 326 of 26 October 2012.

[123] Duina F. (1997) "Explaining legal implementation in the European Union." *International Journal of Sociology of Law* 25: 155-179.

[124] Pachuca-Smulska B. (2020) "The Impact of Regulatory Techniques."

[125] Kerber W. (2016) "Digital markets, data, and privacy: Competition law, consumer law, and data protection."

[126] Ibd.

[127] Chapter of Fundamental Rights of the European Union (2000/C 364/01). Official Journal of the European Communities, 18.12.2000.

[128] Consolidated version of the Treaty on the Functioning of the European Union. OJ C 326, 26.10.2012.

[129] Zaharieva K. (2010) "Perplexity of Implementing the EU Strategy for Digital Single Market. A Case Study on Health Technology Assessment process and the Early Awareness and Alert activities" accessed June 19, 2020, https://independent.academia.edu/kristinazaharieva

(f) Processed in a way that ensures appropriate security of personal data including protection against unlawful data processing, damage, destruction or loss (thereby introducing the principles of `integrity and confidentiality´).[130]

As will be stressed later in the analysis, the new but still not fully enacted GDPR is viewed as an important step to improve personal data protection where privacy is seen as a fundamental right of EU citizens. Much criticism claims that the basic data protection principles and the contemporary approach of the DSM are incapable of keeping up with developments and changes enforced by the fast speed of digitalization. In order to evaluate this claim, the thesis will proceed to investigate for which purpose the data protection law is designed and how it is currently served in the next section.[131]

### *3.3.2 The GDPR: A Multi-instrument approach with conferral of private rights and design-based techniques*

The last sections provided that there is a wide range of instruments and techniques of the DSM in place that policymakers can utilize in seeking to afford DT within the DM. It was stressed how the GDPR presents an example that illustrates regulatory gaps related to DT, seemingly making the EU data protection regime a work in progress. Principles and standards introduced through the GDPR briefly discussed in the last section concern the collection and processing of personal data within the EU. And this section will now proceed to look into the example of GDPR more in-dept, by analyzing its multi-instrument approach that confers private rights and design-based techniques.[132]

According to the new legal standard introduced by the GDPR, failure to comply with the legal requirements set out in the DSM render it unlawful data activity, which may result in national data protection authority's imposition of penalties.[133] Within the material scope of the DSM the concept of `personal data´ is too broadly formulated and at risk to expand even further with the fast progress of Europe´s digitalization (most strongly seen in the DT of businesses across the EU). This seems to be due to the in-built possibility for the evolving interpretation of the concept of data protection itself,[134] that the GDPR only provides for general measures in combination with the aggregation of data, advances of data analytics, and businesses that increasingly react with DT.[135] Although the GDPR introduced prohibitions concerning the processing of personal data (namely Art. 8 GDPR) and new legal obligations that require so called service controllers (i.e. cloud service providers) to notify data protection authorities and `data subjects´ of `personal data breaches´ (Art. 31-32 GDPR),[136] the term `personal data´ is only defined as any sort of information relating to an identified or identifiable natural person (the above mentioned `data subjects´). An identifiable natural person is one who can be identified directly or indirectly (through identification number, online identified or location data) through one or more factors (specific to physiological, genetic, mental, physical, economic, cultural or social identity).[137] This resulted in a broad, flexible and adaptable definition of personal data, because the reference to `identifiable natural person´ and `information relating to a natural person´ invites interpretation as to what constitutes a relevant possibility of identification and a relevant relationship between information and an individual.[138] As such, key notions of the DSM´s scope concerning data protection determine the material scope of the GDPR regarding all situations in which personal data is being processed[139] (applying to the data protection principles, rights and obligation laid down in Art. 3(1) DPD[140] and Art. 2(1) GDPR[141]). Thus, with introduction of the GDPR, the DSM attempted to make the concept of `personal data´ suitable for the tailored context-specifics of all Member States.[142] Additionally, the EU data protection regime confers a set of rights on data subjects that data controllers are legally obliged to respect. These include requirements for basic information about the scope of data processing (Art. 10-11 DPD), a series of data access rights that enable the data subject to obtain knowledge of the logic involved in any automated processing of data concerning the individual (Art. 12(a) DPD), and a qualified right to object to certain types of fully automated decision-making processes (Art. 15(1) DPD).[143] By assuming physical movement of data from one place to another, the GDPR´s predecessor, the Data Protection Directive 95/46/EC (DPD),[144] made it difficult to reconcile some of the provisions with operations of Internet-enabled technologies such as cloud computing.[145] In a worst-case scenario of cross-border outsourcing of data a cloud customer will not even be able to access stored data that is legally protected from an international operator.[146]

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[130] Yeung K. (2017) *"Making sense of the European data protection law tradition."* In: Andrews L., Benbouzid B., Brice J. Bygrave L.A., Demortain D., Griffiths A., Lodge M., Mennicken A. and Yeung K. (2017) Algorithmic Regulation. London School of Economics and Political Science (LSE), Discussion Paper **85.** London, United Kingdom.

[131] European Commission Proposal for a Regulation of the European Parliament and of the Council on the protection of individuals with regard to the processing of personal data and on the free movement of such data (General Data Protection Regulation), COM (2012) 11 final.

[132] Yeung K. (2017) "Making sense of the European data protection law tradition."

[133] Ibd.

[134] Purtova N. (2018) "The law of everything. Broad concept of personal data and future of EU data protection law. *Law, Innovation and Technology* 10**(1):** 40-81.

[135] Ibd.

[136] Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data and repealing Directive 95/46/EC (General Data Protection Regulation). *OJ L 119, 4.5.2016*

While no compliance and information privacy regulations exist, that specifically address cloud computing, every Member State has relevant regulation in place that regards IT outsourcing, data processing or service provisions.[147] In a bid to reflect in a cloud friendly framework, Art. 29 Working Party (WP29) decided that mirroring personal data from a server in the EU to a US-located server constitutes a data transfer.[148] While this interpretation appeared convenient for the WP29, it failed to resolve the complexities of data export rules in cases of EU cloud transactions. By recognizing this state of affair, the European Commission published a draft proposal for a new data regulation to replace the DPD[149] that provided salient applications to cloud computing models. Although the GDPR has resolved some of the issues related to data privacy, introduced some harmonization of data protection across agencies in each Member State, and ensured the protection of European data protection laws, this area of the DSM must be considered as a work in progress. Links that are clearly unaddressed remain general terms and conditions and service level agreements for clouds in order to cover the portability of data between different cloud types (public, private and hybrid clouds), provisions of data in open formats for data migration, as well as technical, organizational and functional interoperability of data.[150] Additionally, the unclear distinction between *ex ante* and *ex post* approaches in the DSM regulation further complicate affording DT for businesses across the EU.[151] *Ex ante* regimes typically rely on a system of prior approval that might take on a form of licensing regime to track regulatory activities and prohibit data protection breaches through licensing authorities. Such regimes can be contrasted with *ex post* approaches, which typically entail the legal promulgation of certain minimum standards that must meet the specified activity so that anyone wishing to engage does not need to obtain a prior permission but may lawfully engage.[152] Since the contemporary EU data protection regulation of the DSM does not purely exclude the necessity for data controllers to authorize a lawful collection and processing of personal data in advance, it cannot be purely defined as *ex post* regime, but rather mixes with aspects of *ex ante* regulation as well.[153] Given such legal complexities, it seems extremely hard for nations and EU to support business DT for cloud computing in a coherent and holistic legislation that fully complies with national and international law, while enabling adequate information privacy for customers.[154]

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[137] Directive 95/46/EC of the European Parliament and of the Council of 24 October 1995 on the protection of individuals with regard to the processing of personal data and on the free movement of such data.

[138] Purtova N. (2018) "The law of everything."

[139] Ibd.

[140] Directive 95/46/EC of the European Parliament and of the Council of 24 October 1995 on the protection of individuals with regard to the processing of personal data and on the free movement of such data.

[141] Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data and repealing Directive 95/46/EC (General Data Protection Regulation). *OJ L 119, 4.5.2016.*

[142] Schwartz P.M. (2003) "Property, privacy and personal data." *Harvard Law Review* **117:** 2056-2128.

[143] Directive 95/46/EC of the European Parliament and of the Council of 24 October 1995 on the protection of individuals with regard to the processing of personal data and on the free movement of such data.

[144] Directive 95/46/EC of the European Parliament and of the Council of 24 October 1995 on the protection of individuals with regard to the processing of personal data and on the free movement of such data.

[145] De Hert P. and Papakonstantinou V. (2012) "The Proposed Data Protection Regulation Replacing Directive 95/46/EC: A Sound System for the Protection of Individuals." *Computer Law & Security Review* 28**(4):** 130 -142.

[146] Gellert R. (2015) "Data protection: a risk regulation? Between the risk management of everything and the precautionary alternative." *International Data Privacy Law* **5:** 01-19.

[147] Ibd.

[148] Article 29 Working Party Opinion 10/2006 on the processing of personal data by the Society for Worldwide Interbank Financial Telecommunication (SWIFT), WP128 (2006).

[149] European Commission "A proposal on the protection of individuals with regard to the processing of personal data and on the free movement of such data (General Data Protection Regulation) COM (2012) 11 final," accessed May 26, 2020, https://www.huntonprivacyblog.com/wp-content/files/2013/01/Albrecht-Report-LIBE.pdf

Despite the criticism of the EU approach to data protection, the GDPR clearly started to place a greater emphasis on the concept of accountability than its predecessor, the DPD Directive,[155] which also concerns data export provisions with little impact on cloud transactions.[156] Data processing of a cloud provider in the EU is thus subject to the law or the authority of the European Economic Area (EEA) states, in which providers are headquartered (regardless of where customers are located). With this regulation the EU ensures that data processing and providers headquarters are only practicable for providers within the EEA area. This way the GDPR protects EU citizens from problematic foreign regulations, such as in the case of US providers that when offering cloud service in the EEA must guarantee that personal data does not leave the EU, China where telecommunication and internet services are still heavily regulated by the state and so cloud providers often are subject to clear government surveillance and censorship, or India where despite of strong economy remains a risk in cloud computing for the EU remains due to missing data protection regulation.[157] Thus, another significant innovation in the regulatory techniques introduced by the GDPR is a right concerning data portability (Art. 18 GDPR) and new requirements of `data protection by design and default,´ which essentially impose legal obligations on data controllers to fulfill data protection (Art. 23 GDPR).[158] Taking together, the DSM (including the GDPR) has resulted in four major transformations at the core of the shift digitalization enforced:

*(a) A blurring of the distinction between reality and virtuality;*
*(b) A blurring of the distinction between machine, nature and human;*
*(c) A reversal from information scarcity to information abundance;*

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[150] Pechardscheck S. (2020) "In Cloud we trust?"
[151] Yeung K. (2017) "Making sense of the European data protection law tradition."
[152] Ogus A.I. (1994) *"Regulation: legal form and economic theory."* Oxford: Clarendon.
[153] Yeung K. (2017) "Making sense of the European data protection law tradition."
[154] Nwankwo I.S. "Missing Links in the Proposed EU Data Protection Regulation and Cloud Computing Scenarios: A Brief Overview."
[155] Yeung K. (2017) "Making sense of the European data protection law tradition."
[156] Nwankwo I.S. "Missing Links in the Proposed EU Data Protection Regulation and Cloud Computing Scenarios: A Brief Overview," accessed May 26, 2020, https://www.jipitec.eu/issues/jipitec-5-1-2014/3905
[157] Pechardscheck S. (2020) "In Cloud we trust?"
[158] Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data and repealing Directive 95/46/EC (General Data Protection Regulation). *OJ L 119, 4.5.2016*

(d) *A shift from the primacy of stand-alone properties and binary relations to a primacy of processes, networks and platforms*.[159]

From a theoretical perspective, the new GDPR acknowledges that the security of digital data must be secured through a `designed-based´ regulatory technique by the EU that seeks to implement normative standards that Member States can implement to their national environments and business infrastructures.[160] However, while the EU framework was meant to deliver highest levels of protection under all circumstances, Member States in practice continue to differ greatly in their national digitalization approaches. Further, as neither the GDPR nor the DPD provided specific guidelines, the concept of natural person can be understood either broadly or narrowly inviting interpretations of context-dependent assessments.[161] Further, for the case of cloud computing, data protection requirements depend on automated data movements around several data centers that are in different parts of the world.[162] When personal or person-related data is being collected, processed or used in the cloud, data security and protection must be ensured. Much uncertainty around the cloud thus comes not so much from the service offerings or capabilities as described in the previous section, but from legal issues.[163] This location-agnostic feature of cloud computing has several data protection implications because of the multiple jurisdictions that may be involved. Meanwhile, the EU data protection law directives inherent to the DSM, remain rather location-focused.[164]

The EU authority for cyber safety ENISA however provides guidelines in form of detailed checklists to help Member States assess criteria for cloud suppliers and the German Federal Office for Information Security (BSI) offers a measure catalogue of minimum safety requirements for cloud providers at German national level. Nonetheless, these standards remain open, vague and based on user-cases. Thus, a specification of standards is urgently needed to help adjust internal business processes and practices that ensure legal confidence and efficient digital service.[165] Altogether the EU data protection regime of the DSM relies on several command-and-control techniques typically applied by a public enforcement authority at EU level, supplemented by private rights regimes, and recently bolstered by the introduction of `design-based´ strategies for data protection as enforced by the GDPR.[166] Consequently, the DSM with EU data protection regulation is facing a risk of becoming the `law of everything,´ while the private and public sector seem to become increasingly intertwined.[167] In recent years, fifteen national initiatives for digitalizing industry have been launched across Europe. As value chains increasingly distribute among Member States, EU legislators expect further digitalization of industry to bring about challenges that can only be addressed through a coordinated, coherent and holistic, European-wide effort, that considers support and cooperation between the public and private sector. Accordingly, the EU has noted that to ensure a well-functioning DM, it is necessary to strengthen cooperation between the Member States. This includes not only support and the sharing of best practice examples in science and education like skills and jobs,[168] but also the acknowledgement of a transforming business world with new digital business models due to digitalization, since a fair and frictionless market helps businesses of all sizes and in any sector to compete on equal terms. Only if fair market conditions are ensured, businesses can develop, innovations promoted, new technologies and services become implemented. The DSM addresses this by increasing transparency and fair market conditions to ensure shareholders, investors and consumer confidence.[169]

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[159] Floridi L. (2015) *"The Online Manifesto. Being Human in a Hyperconnected Era."* Oxford University: Oxford, United Kingdom.

[160] Yeung K. (2008) *"Towards an understanding of regulation by design."* In: Brownsword R. and Yeung K. (eds.) Regulating technologies: legal futures, regulatory fames and technological fixes. Portland OR: Hart Publishing.

[161] Floridi L. (2015) *"The Online Manifesto. Being Human in a Hyperconnected Era."* Oxford Internet Institute: United Kingdom.

[162] Svantesson D. (2012) "Data Protection in Cloud Computing – The Swedish Perspective." *Computer Law & Security Review* 28(**4**): 476-480.

[163] Pechardscheck S. (2020) "In Cloud we trust?"

[164] Svantesson D. (2012) "Data Protection in Cloud Computing – The Swedish Perspective."

[165] Yeung K. (2017) "Making sense of the European data protection law tradition."

[166] Morgan B. and Yeung K. (2007) *"An introduction to law and regulation."* Cambridge: Cambridge University Press.

[167] Pachuca-Smulska B. (2020) "The Impact of Regulatory Techniques."

[168] Commission (2017b) "Digital Single Market Mid-term Review: Commission calls for swift adoption of key proposals and maps out challenges ahead" accessed April 21, 2020, https://ec.europa.eu/digital-single-market/en/news/digital-single-market-mid-term-review

The DSM legislation is quite extensive and will require many years to achieve full implementation. At the same time, as previously discussed, the fragmentation of the strategy due to heterogeneous national rules is not conducive to harmonization. On the one side, continuously imposed regulations can help Member States to economically catch up. While some researchers argue that this type of positive integration is the best solution for fair market conditions and in order to complete the single market project, more detailed regulation might on the other hand create barriers for Member States' access to the DM.[170] While this regulatory pendulum continues to swing and the DSM scope gets rethought by EU legislators, researchers are arguing in favor of deregulation (negative regulation) as a new paradigm that famous economists have long pushed, arguing markets need space to regulate themselves. However, regulators decided to continue with the approach of positive integration for the single economic market in the area of data protection that the DSM increasingly concerns,[171] while aiming for maximum possible law harmonization. Thereby Member States are required to adapt to EU legislation, without replacing existent national law. However, certain areas remain solely up to Member State´s regulation and thus cannot be covered by the DSM. Furthermore, maximum harmonization cannot guarantee that rules are enforced identically in each Member, specifically those concerning data protection for intermediate services. Thus, regulation can have unintended consequences that may emerge when Member States need to change their national legislation.[172] This suggests that there is still a need for more detailed regulation and coordination at the supranational level in order to capture all problems arising from the development and changes digitalization enforces on the DM.[173]

# 4 The Socio-Organizational Coordination of the European Digital Single Market

So far it has been identified that since implementation of the DEI, Member States have taken diverging national and regional actions for the digitalization of their economies. As it was stressed in the previous chapter, key factor for successful digitalization is legal certainty and a regulatory framework able to encourage Member States' businesses to adopt new technology and DT. Thus, better regulation and legal certainty are main prerequisites for investments by private and public sectors that afford DT. Despite of recent efforts, diversified manufacturing powers of the Member States have facilitated very different industrial policies. Many Member States have made long-term strategies and investments under the umbrella of the DSM strategy or through several more specific initiatives, which this chapter will analyze. Among the most thorough approaches to industrial digitalization count the so-called Industry 4.0 initiatives that was first implemented by Germany and will be elaborated upon first within the next section.[174]

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[169] Commission (2019b) "Shaping Europe´s digital future."

[170] Pachuca-Smulska B. (2020) "The Impact of Regulatory Techniques."

[171] Scharpf F. (1998) "Negative and Positive Integration in the Political Economy of European Welfare States."

[172] Wallheimer B. (2019) "Why less regulation isn´t necessarily better. The longstanding debate about government oversight is giving way to new understanding of how to craft more effective industry rules," accessed 15 July, 2020, https://review.chicagobooth.edu/public-policy/2019/article/why-less-regulation-isn-t-necessarily-better

[173] Pachuca-Smulska B. (2020) "The Impact of Regulatory Techniques."

[174] Ibd.

## 4.1 Development of the Industry 4.0 Framework

As digitalization is rapidly spreading worldwide, businesses increasingly develop related digital skills which translate into new digital business models.[175] Companies face this global trend by adapting their production processes to new customer needs and advanced technologies allow businesses to monitor consumers' behavior and respond to new preferences. Having cleared up how data protection law and digitalization is regulatorily served at EU level within the previous chapter, and having emphasized on how Member States engage at national level to foster the digitalization of their economies, the following two sections will investigate how German legislators have recently tackled these issues by enforcing the tremendous national initiative called "*Industrie 4.0*." This German framework, adopted first 2011 during the Hannover Faire where governmental working groups announced a project for the development of the German manufacturing sector "*Zukunftsprojekt Industrie 4.0*" has developed into a leading EU theme within the context of digitalization.[176]

Because small and medium-sized corporations increasingly participate on international markets, German legislators saw a demand to modernize the German domestic law through the Industry 4.0 framework. Thus, the term Industry 4.0 got applied to a group of rapid transformations in the design, manufacture, operation, and service of manufacturing systems and products.[177] As the development of many new and advanced technologies can make corporate governance of businesses more complicated, a reform of German national regulation with focus on the own manufacturing sector aimed to resolve problems of domestic manufacturing by enhancing transparency and compliance with the EU regulatory framework.[178] Accordingly, possibilities and basic ideas of Industry 4.0 affect all industries, including non-manufacturing.[179] Whereas in the past production was based on standardization, nowadays the main driver of investments in new technologies is primarily the need to improve the market, customize products and produce more efficiently. Viewed this way, one of the main factors that has influenced the revolutionary change is a changed volatility in market demand.[180] In Germany policymakers have adopted the Platform Industry 4.0 to encourage the digital transformation of businesses within the framework of a national High Tech 2020 Strategy. Ambition is to strengthen the competitiveness of German firms by increasing investments in digital skills and research. Moreover, the strategy includes supportive measures such as communication standards in the Internet of Things or investments for the private sector. In close cooperation with scientists, employers´ associations, trade unions and politics, 300 stakeholders from at least 160 organizations are still actively involved in Industry 4.0. In Germany, the platform has developed to the main network for businesses to implement new technologies. Accordingly, several international agreements between Germany with the rest of the world highlight the key role of Industry 4.0 in global perspective. Thus, public-private partnership is of primary importance, because they facilitate the exchange of information and best practices. This encourages investment, research, and the exchange of operational strategies in appropriate international cooperation. International cooperation, especially across Europe, is an essential tool to renovate industry and guarantee access to talents and resources.[181] Thus, Industry 4.0 encompasses a series of sophisticated technologies (i.e. Internet of Things (IoT), Big Data, Cyber Physical System and Additive Manufacturing) and shortly after its enforcement in Germany inspired many similar initiatives in Member States and on EU level.[182] Digitalization laws of Member States across the EU are very diverse. For instance, one may observe differentiations in national jurisdictions as to the roles and values of data protection as it was highlighted in the example of the DSM inherent GDPR. In comparison to other Member States, Germany provides for a relatively high share of manufacturing industries. Due to the implementation of Industry 4.0, Germany was able to modernize its industry and prepare a status as "export World Champion."[183] As the example of the German national digitalization framework provides evidence for, Member States can benefit from exchange and examples of successful national initiatives and have thus followed the German Industry 4.0 framework. In this respect the following considers the diverse industry-related Member State initiatives within the DSM by providing a comparative overview of diverging regional digital initiatives and seeks to point out key lessons learned from Industry 4.0 policies. Additionally, it will be highlighted how the EU could facilitate exchange of good practice between Member States, in order to collect and complement the 15 existing Industry 4.0 initiatives under a common EU platform umbrella. Although the analysis findings suggest that Germany with its Industry 4.0 framework is already at the forefront of digitalization in the EU, the case study (that will be introduced in **Chapter 6**) will reveal some crucial aspects, that still seem to be missing in the DSM to ensure that businesses can successfully implement DT.[184]

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[175] OECD (2017) "Digital Economy Outlook 2017" accessed April 11, 2020, https://espas.secure.europarl.europa.eu/orbis/sites/default/files/generated/document/en/9317011e.pdf

[176] Commission (2016) "Digitising European Industry – catalogue of initiatives."

[177] Ibd.

[178] Hermalin B.E. and Weisbach M.S. (2007) "Transparency and Corporate Governance." *NBER Working Paper Series*, Working Paper 12875. National Bureau of Economic Research Massachusetts, Cambridge.

[179] Bundesverband der Deutschen Industrie e. V. (BDI) (2013) "Cloud Computing Wertschöpfung in der digitalen Transformation" accessed June 22, 2020, https://bdi.eu/media/presse/publikationen/information-und-telekommunikation/Cloud_Computing.pdf

[180] Rüßmann M., Lorenz M., Gerbert P., Waldner M., Justus J., Engel P. and Harnisch M. (2015) "Industry 4.0: The Future of Productivity and Growth in Manufacturing Industries" accessed April 11, 2020, https://www.bcg.com/publications/2015/engineered_products_project_business_industry_4_future_productivity_growth_manufacturing_industres.aspc

## 4.2 Member States Industry 4.0 Initiatives

Traditional manufacturing sectors require extensive digital investment and long-term visions to remain competitive and contribute to a business strength of EU leadership on the international market.[185] The EU has acknowledged that a trustworthy digital environment is needed and committed to set global standards for emerging technologies in order to keep its regions open for trade and investment. Accordingly, the Union strives to become a sustainable digital society by enhancing democratic values, respect for fundamental rights, and contributions to a climate-neutral and resource-efficient economy.[186] The first industry-related initiative of the DSM aimed to complement the various national and regional initiatives for digitizing industry, such as "*Smart Industry*," "*Industrie du future*," or "*Industrie 4.0"* with a budget of €37 million. New focus was put on the creation of conditions for the digital industrial revolution, which contained four key action pillars, consisting of financial support, policy instruments, coordination, and legislation powers to trigger future investment in all industrial sectors.

In some countries, the Industry 4.0 policies were direct result of overarching national frameworks or strategies. In Spain for instance, this presented a digital part under a national agenda for strengthening the Spanish industrial sector. Policies then gradually transformed into the framework of "*Industria Conectada 4.0."* The French and Spanish Industry 4.0 initiatives both took market-based approaches by providing loans to companies participating in their industry programs. Notwithstanding the common goals, Industry 4.0 policies in Member States show some variation in how economic objectives are to be achieved. While most countries, especially Germany, focus on gaining higher productivity and greater efficiency, the United Kingdom and Italy focus on delivering advanced technology and development of new products to improved national industrial processes. Thus, although Industry 4.0 policies often have common goals, they all possess elements with a unique national touch.[187] As Member States' legal and normative ability is constraint by challenges of the current Forth Industrial Revolution, some are taking attempts to build up specific framework conditions for digital innovations that allows for business DT at regional level. Thereof, France implemented the "*Loi pour une République Numérique*" regulatory framework on topics of digitalization in October 2016. Similarly, one of the axes of the Digital Luxembourg is data regulation, that ensures privacy, protection, and a free flow of data, and Poland´s intensive policy framework focuses on the national tax system and safeguarding intellectual properties.[188] However, digitalization is also about the extent to which firms and industries invest in and use advanced technologies. Since the EU economy is digitized unevenly, large variations cannot only be seen between Member States, but also sectors and firms. While European ICT sectors are at the international digital frontier, closely followed by media and finance, large traditional sectors are far behind (i.e. real estate or wholesale trade). Vis-à-vis these frictions, Europe is much less advanced than it could be and underperforms in comparison to China or the United States which show greater digital power.[189] In an attempt to tackle this problem at national level, Germany, France and Italy announced in June 2017 a trilateral cooperation in form of a shared action plan to support and strengthen the digitalization process of their manufacturing sectors.[190] In the digital world, billions of connected devices need to communicate and interact safely and seamlessly, regardless of their manufacturing location or country of origin. For this they need a common language that is achieved through standardization and interoperability. Since new investments can offset negative impacts digitalization may enforce on Member States industries, standards can help to facilitate implementation and support a positive productivity return for national economies. A major benefit of standardization is the opening of markets, the easing of market access for innovative products, the reduction of legal compliance, integration and verification costs, technical solutions based on consensus and experience, and increased transparency. Thus, parts of the triangular cooperation accelerate standardization as key parts of national Industry 4.0 platforms to promote additional private and public partnership and support the creation of a data ecosystem at EU level with open and common standards.

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[181] Miso (2019) "Germany, France and Italy join forces to promote digitizing manufacturing, Platform Industrie 4.0" accessed April 12, 2020, https://www.mise.gov.it/images/stories/documenti/press%20release_trilateral-cooperation.pdf

[182] Forschungsunion Wirtschaft und Wissenschaft (2012) "Deutschlands Zukunft als Produktionsstandort sichern. Umsetzungsempfehlungen für das Zukunftsprojekt Industry 4.0" accessed June 22, 2020, http://www.forschungsunion.de/pdf/industrie_4_0_umsetzungsempfehlungen.pdf

[183] Ibd.

[184] Commission (2017c) "National Initiatives for Digitising Industry across the EU.

[185] Commission (2017d) "Industry in Europe" accessed June 17, 2020, http://publications.europa.eu/resource/cellar/354c1e8b-1db0-11e7-aeb3-01aa75ed71a1.0001.03/DOC_1

[186] Commission (2019b) "Shaping Europe´s digital future."

Thereof, Italy implemented a `Piano Nazionale´ "*Industria 4.0*" initiative and committed to investments of €200 million for the establishment of selected competence centers. The Dutch government funded implementations of field labs to offer opportunities for testing and demonstrating in specific areas of industrial transformation. Denmark implemented a network of `Approved Technological Institutes´, consisting of eight institutes that develop and sell technological services to Danish companies. Although the institutions are active in digitalization and advanced production, their performance activities remain very broad. Luxembourg developed a powerful High-Performance Computer facility in cooperation with the University of Luxembourg to combine computing resources with extensive data storage facilities as a strategic national asset and approached digitalization on the basis of comparative technological advantage to foster its national economic competitiveness. Meanwhile Sweden has also reached a leading position in several areas of digitalization in Europe. The country´s national measures are geared to the needs of the local companies and match well in line with DEI priorities. Additionally, Sweden´s national platform strategy is bound to industry organizations and based on existing cooperation structures in technology transfer (i.e. innovation partnership programs). The various mentioned Member States' digitalization initiatives and programs illustrate, that digitalization of EU economies not only concerns the transformation of old-fashioned production sectors, but concerns partnerships for digital value chains and platforms, as well as the adoption of new technologies by businesses that foster DT.

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[187] Commission (2019b) "Shaping Europe´s digital future" accessed April 12, 2020, https://ec.europa.eu/digital-single-market/en/content/fair-and-competitive-digital-economy

[188] Commission (2017c) "National Initiatives for Digitizing Industry across the EU."

[189] McKinsey (2020) "Digital Europe: Realizing the continents potential."

[190] Miso (2019) Germany, France and Italy join forces to promote digitizing manufacturing, Platform Industrie 4.0" accessed April 12, 2020, https://www.mise.gov.it/images/stories/documenti/press%20release_trilateral-cooperation.pdf

An evaluation of existing international cloud standards by the German Federal Ministry of Economics and Technology (BMWi) from 2012 revealed, that almost none of the regulatory standards implemented by the DSM regards matureness and comprehensiveness of data. The document was revised and updated again in 2014 regarding measures implemented by the German Industry 4.0 strategy and concluded that businesses still hesitate to implement cloud services, because the regulatory framework in scope does not accurately support DT. Although the Ministry report concludes, that Germany has potential to become an influential cloud provider for EU citizens, there is still a lack of coherent regulation within the Industry 4.0 umbrella. The Ministry claims that "Cloud Made in Germany" can only become economically successful if the national legislation allows efficient use of cloud services. In accordance with the findings of the interviews conducted with business practitioners of SAP and Siemens, legal experts, and political entrepreneurs, the BMWi suggests that a major to improvement regarding the Industry 4.0 framework would be to implement similar innovation friendly scopes as provided by the DSM. Although many standards in the GDPR regulation cover specific aspects of cloud computing and Member States have enforced many national standardization initiatives, these efforts have not led to a framework that allows to easily manage cross-coordinated and generally accepted standards for clouds across the EU. This suggests that national and EU level regulation misses to provide consistent security standard mechanisms (i.e. host security) and processes to ensure greater security for intermediate services like cloud.[191]

# 5 The Economic Dimension of Digitalization

The digital progress of the last century has made the world more productive and efficient, by delivering waves of innovation and consumer welfare.[192] Products specific to contemporary advanced technology have significant impact on dynamics that are re-shaping and disrupting the EU single market.[193] As this chapter will outline, several industrial developments have led to the digitalized EU society in its current form. This chapter will introduce an overview of how to distinguish and define digitalization that has stimulated a shift in market dynamics and pabed the way for the emergence of new key platforms, networks, proliferation of multi-sided markets and DT (also defined as digital change) including revolutionized products, services and business models.[194]

## 5.1 The Four Industrial Revolutions

This section will introduce a short overview of historical developments that have led to several industrial revolutions, from which the first one – known as Industry 1.0 – took place at the end of the 18th century, during which large amounts of capital, steam engines and the massive use of coal transformed traditional markets. In consequence of the disrupted industry, a growing strand of workers migrated to cities, which boosted economic efficiency and production rates around the world. By the end of the 19th century, the growing steel and chemical industry then fostered a Second Industrial Revolution which triggered further rural-urban migration. Meanwhile, new forms of energy had been developed, and electricity changed the production process. Although legislative reforms and active financial support was already a common theme, national governments developed their economic and social structure in different ways. Additionally, a range of modern technologies, the Internet and other information technology started to rapidly transform the European economic environment. Placed in this broad historical context, the outcome captured the Third Industrial Revolution.[195] While innovations of Information and ICT started to spread widely, the internet increasingly connected people all over the world by initiating a process known as globalization. Simultaneously the internationalization of businesses started to enforce an opening of EU Member State markets.[196] Thus, by the beginning of the 21th century, the way of business making changed also [197] as todays information economy started to be ushered.[198] As the revolutions demonstrated, technology provides a major impact on states labor markets and consequently shapes the economic environment for EU business making. With new technologies and broad-based innovations spreading even faster than in previous phases, a new innovative revolution is already in its developing state. This phenomenon of accelerated digitalization is known as Forth Industrial Revolution and concerns IoT, data processing, additive manufacturing, big data and[199] are expected to have positive effects (i.e. increased efficiency and productivity) on the European economy.[200] However, scope, magnitude and omnipresence of the disruptive impact in which the Forth Industrial Revolution is transforming each and every Member State of the EU is yet still progressing[201] (see **Figure 1** in the appendix). Accordingly, digitalization today is recognized as one of the essential trends changing civilization and industry in the near- and long-term future, with yet unforeseen outcomes.[202] What is certain however, is, if correctly addressed, that the impacts of digitalization can add undeniable gains of productivity and competitiveness to the European economy.[203]

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[191] BMWi (2018) "Trusted Cloud. Innovatives, sicheres und rechtskonformes Cloud Computing" accessed 03 June, 2020, https://www.bmwi.de/Redaktion/DE/Publikationen/Digitale-Welt/trusted-cloud-cloud-computing-version-2.pdf?__blob=publicationFile&v=5

[192] Neamtu D.M., Hapenciuc C.V. and Bejinaru R. (2019) "The Impact of Digitalization on Business Sector Development in the Knowledge Economy." *Proceedings of the 13th International Conference on Business Excellence 2019:* 479-491.

[193] Ghinea V.M., Dima A.M. and Hadad S. (2017) "Excellence Model for Sustainable Convergence in the EU Higher Education. *Amfiteatru Economic* 19**(3)**: 1107-1122.

[194] Ezrachi A. (2018) "EU Competition Law Goals and The Digital Economy." *Oxford Legal Studies Research Paper No.* **17:** 02-27.

## 5.2 Digitalization, Digitization and Digital Transformation

As the Forth Industrial Revolution is proceeding fast, discussions about digital transformation continue to persist and the terms `digitization´ and `digitalization´ add confusion.[204] Viewed from a semantic perspective, though sounding very similar, the terms have very distinctive meanings, which is further complicated as there exists no clear, single definition of digitalization. Most of the literature focuses on AI, big data, data analytics and social media as

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[195] Neamtu D.M. et. al. (2019) "The Impact of Digitalization on Business Sector."

[196] Schwab K. (2018) *"Shaping the Forth Industrial Revolution."* World Economic Forum, Geneva: Switzerland.

[197] Chua F. (2013) "Technology trends: their impact on the global accountancy profession" accessed June 23, 2020, https://www.accaglobal.com/content/dam/acca/global/PDF-technical/futures/pol-af-ttti.pdf

[198] Neamtu D.M. et. al. (2019) "The Impact of Digitalization on Business Sector."

[199] Skilton M. and Hovsepian F. (2017) *"The 4th Industrial Revolution: Responding to the impact of artificial intelligence on business."* Palgrave McMillan, London.

[200] Neamtu D.M. et. al. (2019) "The Impact of Digitalization on Business Sector."

[201] Gbadegeshin S.A. (2019) "The Effect of Digitalization on the Commercialization Process of High-Technology Companies in the Life Science Industry." *Technology Innovation Management Review* 9(**1**): 49-63.

[202] Parviainen P., Tihinen M., Teppola S. and Kääriäinen J. (2017) Tackling the digitalization challenge: How to benefit from digitalization in practice." *International Journal of Information Systems and Project Management* 5(**1**): 63-77.

[203] Neamtu D.M. et. al. (2019) "The Impact of Digitalization on Business Sector."

[204] Ibd.

digitalization tools[205] and some authors indicate a limited coverage of the digitalization term.[206] An unrefined search for academic publications using the term DT yields a wide range of definitions, the phenomenon suggests being defined from various perspectives, and as grouped in **Figure 2** in the appendix. DT refers to the ongoing digital relationship that fosters businesses' economic transformation. Accordingly, DT also concerns perceptions of customer expectations that are managed by businesses. Thus, to the actual drivers of DT also count business digital infrastructures (i.e. networks), applications (i.e. cloud service) and the exploitation potential based on digital value, that can follow when DT leads to a new digital business model.[207] While the idea of DT arises from the blending of personal and corporate IT environments, the transformational effects ground in the development and occurrence of new digital technologies, such as social media, analytics, mobile, cloud and information technology (SMACIT).[208] Accordingly, multiple perceptions of DT have emerged in the literature, from which the broadest perception describes DT as the integration of digital technologies and business processes into the digital economy.[209] A similar wide-ranging view regards DT as the use of SMACIT to rapidly improve the performance or reach of businesses.[210] A more detailed perception however views DT as the use of new technologies to impact three major organization dimensions: **externally**, with a focus on customer experiences and altering the entire business cycle through digital enhancement; **internally**, affecting the corporate business structure, decision-making, operations and processes; and **holistically**, whereby all business segments and functions are affected.[211] This often leads to the disruption of traditional markets and the deployment of entirely new business models – namely DT.[212] In a nutshell it can be summarized that academia has come to agreement that DT is enforcing a fundamental shift in reaching a superior performance that is linked to internal, external and holistic business dimensions. In the analysis, DT will thus be understood as the application of technology to build new business models, processes, software and systems. Thereby, businesses achieve transforming effects with the application of new business models and transforming processes, the empowerment of workforce and innovations, as well as personalized customer experiences. In turn, digital transformation can result in more profitable revenue, higher efficiency and greater competitive advantages.[213]

As digitalization effects firm's decision-making and corporate structure, digital business models are ultimately connected to the EU single market and remain at the core for international competitiveness.[214] While the perspectives are represented in the figure distinctively, they may also overlap. Thus, digitization essentially refers to the straightforward process of converting analog information into digital and encoding it so that computers can store, process and transmit it. Accordingly, the concept often captures moving a process from manual to digital. As such, digitization can deliver significant operational efficiencies, while reducing errors.[215] Digitization contrary to digitalization is not a driver of new business models or disrupts fundamental business strategies. Only digitalization dominates the area of business model change and adds value through new digital business forms.[216] Fitting into the broad understanding of industrial global revolutions elaborated throughout the last section, digitalization refers to the way in which many domains of the society and economy are restructured around digital infrastructure. According to this **digital era** perspective, digitalization stresses the fundamental change in our world due to the pervasive nature and proliferation of digital technologies.[217] Arguably, as we have reached the Fourth Industrial Revolution, both, development and diffusion of digital innovations, are proceeding much faster than ever before.[218] Characterized by dynamism, customization and intense competition digitalization has encouraged a new global world **economy** in which cornerstones involve the embedding of new digital knowledge, technology and innovation into products and services.[219] Additionally, the novel of this digitalization concept understands the European economy as a circular or sharing economy, that is shifting from linear take-make-dispose models of resources to a model where flows of materials, energy, labor and new information interact and promote a more productive economic EU system.[220]

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[205] Parvianinen P., Tihinen M., Kääriäinen J. and Teppola S. (2017) "Tackling the digitalization challenge: How to benefit from digitalization in practice." *International Journal of Information Systems and Project Management* 5(1): 63-77.

[206] Henriette E., Feki M. and Boughzala I. (2015) "The Shape of Digital Transformation: A Systematic Literature Review." *Ninth Mediterranean Conference on Information Systems (MCIS)*: 431-443.

[207] Matt C., Hess T. and Benlian A. (2015) "Digital Transformation Strategies." *Business & Information System Engineering* 57: 339-343.

[208] Sebastian I.M., Ross J., Beath C., Mocker M., Moloney K. and Fonstad N. (2017) "How Big Old Companies Navigate Digital Transformation."*MIS Quarterly Executive* 16(3): 197-213.

[209] Liu D.Y., Chen S.W. and Chou T.C. (2011) "Resource fit in digital transformation: Lessons learned from the CBC Bank global e-banking project." *Management Decision* 49(10): 1728-1742.

[210] Westerman G., Bonnet D. and Mcafee A. (2014) „The Nine Elements of Digital Transformation." *MIT Sloan Management Review* (January): 01-06.

[211] Kaufman I. and Horton C. (2015) "Digital Transformation: Leveraging Digital Technology with Core Values to Achieve Sustainable Business Goals." *The European Financial Review* (December–January): 63-67.

[212] Hess T. et. al. (2016) "Options for Formulating a Digital Transformation Strategy."

[213] Schwertner K. (2017) "Digital Transformation of Business." *Trakia Journal of Sciences* 15(1): 388-393.

[214] Kowalkowski C., Windahl C., Kindström D. and Gebauer H. (2015) "What service transition? Rethinking established assumptions about manufacturers´ service-led growth strategies." *Industrial Marketing Management* 45(1): 59-69.

Within the more precise **industry** perspective, new digital technologies are disruptive in nature, revolutionize the way that industries operate and traditional boundaries between them dissolve. Throughout recent years advanced manufacturing seeks to enable EU industries to navigate their way through digitalization using service reorientation of traditional industries.[221] As new technologies have also accentuated changing **network** dynamics from the center of businesses to accommodate digitally engaged customers, consumers and communities are understood to co-create value for the EU digital ecosystem.[222] The usage of new technology and automation increases as major part of the digitalization process, people´s life's and jobs change.[223] Therefore, the need for DT is a clear business reality which occurs in all types of industries and impacts companies of all shapes and types.[224] Viewed from this **company**-economical perspective, digitalization also shifts work roles and transforms businesses. [225] DT is further exhibited within the extended self of **individuals**, where technological change dramatically affects the way in which EU citizens present themselves, communicate, engage and work.[226] The individual level of digitalization and DT allows an exponential increase in digital data volume, revealing a huge amount of information floods that include risks of bypassing intentionally constructed legal barriers.[227] Thus, digitalization also refers to the use of digital technology to create and harvest in a new innovative way,[228] and when understanding digitalization from this perspective, it is tied to business processes that digital technologies can transform by providing new revenue and value-adding opportunities.[229] Businesses need to accommodate with the digitalizing economic environment they operate in, because only companies embracing digital innovation can maintain productivity and performance.[230] Recent work related to DT mainly focuses on challenges, drivers and failures of previous DT attempts and the pivotal role of dedicated DT strategies has been recognized in the literature stream, more in-depth analysis to fully comprehend how transformation can be achieved. This includes a better understanding about how DT is captured by the EU regulatory framework.[231] Exploring DT from a strategic point of view should therefore enhance the academic literature with valuable insights into corporate structure, including business practice and processes, to allow an understanding of underlying strategic building-blocks of the transformation that diverse businesses in the European economy are attempting. Thereof, the process of DT may substitute existing traditional business models with new innovative ones. Consequently, the agility of DT facilitates ongoing digitalization initiatives but should not be confused with them.[232]

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[215] Bloomberg J. (2017) "Digitization, Digitalization, And Digital Transformation: Confuse Them At Your Peril," accessed May 12, 2020, https://moniquebabin.com/wp-content/uploads/articulate_uploads/Going Digital4/story_content/external_files/Digitization%20Digitalization%20and%20Digital%20Transformation%20Confusion.pdf

[216] Gobble M.A. (2018) "Digitalization, Digitization, and Innovation." *Research-Technology Management* 61**(4)**: 56-59.

[217] Anderson, J. and Lanzolla, G. (2010) "The Digital Revolution is Over: Long Live the Digital Revolution!" *Business Strategy Review* 21**(1)**: 74–77.

[218] Schwab K. (2016) "The Fourth Industrial Revolution."

[219] Atkinson R. (2005) "Prospering in an era of economic transformation.*" Economic Development Journal* 4**(3)**: 33–38.

[220] Schwab K. (2016) "The Fourth Industrial Revolution."

[221] Lasi H., Fettke P., Kemper H.G., Feld T. and Hoffmann M. (2014) "Industry 4.0." *Business and Information Systems Engineering* 6**(4)**: 239–242.

[222] Gray P., El Sawy O.A., Asper G. and Thordarson M. (2013) "Realizing Strategic Value Through Center-Edge Digital Transformation in Consumer-Centric Industries." *MIS Quarterly Executive* 12**(1)**: 115–117.

[223] Katsamakas E. (2014) "Value network competition and information technology." *Human Systems Management* 33**(1)**: 7–17.

[224] Basole R.C. (2016) "Accelerating Digital Transformation Visual Insights from the API Ecosystem." *IT Pro* 18**(6)**: 20–25.

[225] Bloomberg J. (2017) "Digitization, Digitalization, And Digital Transformation."

[226] Hess T., Matt C., Benlian A. and Wiesböck F. (2016) "Options for Formulating a Digital Transformation Strategy." *MIS Quarterly Executive* 15**(2)**: 123–1

[227] Neamtu D.M. et. al. (2019) "The Impact of Digitalization on Business Sector."

[228] Gobble M.A. (2018) "Digitalization, Digitization, and Innovation."

### 5.3 Digitalization as Business Model Driver and the European Business Sector

With digitalization speeding ahead, DT has developed into a prime topic for businesses across the world[233] and the academia broadly anticipates, that companies unable to adapt to digital development might fall victims[234] to "digital Darwinism."[235] Fitting this context, the history of the EU business sector has been plagued with failed attempts of businesses, that focused solely on digitalization without taking broader strategic decision areas linked to DT into account.[236] Having provided an overview of how digitalization has enforced the Forth Industrial Revolution and how to distinguish between the terms of digitalization, digitization and DT in the previous sections, the following will proceed to introduce a theoretical framework of the interrelation between public and private sector, to invite for a discussion of the EU regulatory framework for digitalization.[237]

As highlighted in the previous sections, the EU economy is experiencing the fast proceeding Forth Industrial Revolution that transforms Member States' societies, industries, economies, and businesses,[238] however with great differentiation among national legislations. The digitalization of the economy as technological revolution requires the adaptation of a legal framework for markets and the European economy.[239] Rather than on creating new industries, the emphasize of the current EU regulatory framework lies on the transformation of existing businesses and industrial sectors.[240] Given the process and development of digitalization, this includes the implementation of different strategies in the area of the digital single market.[241] Despite attempts of national and EU policymakers, several businesses remain unable to keep pace with the new digital era - mostly because of a lack of clarity about strategic consideration in their DT endeavors.[242] The following will provide an overlook of EU strategies and regulation from an economic perspective in order to provide a better understanding of implications for individuals, businesses and the societies of the Member States. Moreover, throughout the analysis it will further investigate how some of these managerial attempts of the strategy failed short to deliver useful tools for entrepreneurial practitioners in the private sector and left regulatory gaps, that urgently need to be addressed in form of reformation. Besides some reports, guidelines, and initiatives, there are not as many scholarly studies on how the EU regulatory framework addresses this topic.[243]

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[229] Bloomberg J. "Digitization, Digitalization, And Digital Transformation."

[230] Neamtu D.M. et. al. (2019) "The Impact of Digitalization on Business Sector."

[231] Matt C., Hess T. and Benlian A. (2014) "Digital Transformation Strategies." *Business & Information Systems Engineering* 57**(5)**: 339–343.

[232] Ismail M.H., Khater M. and Zaki M. (2017) "Digital Business Transformation and Strategy: What Do We Know So Far?" *Cambridge Service Alliance*: 01-35.

[233] Von Leipzig T., Gamp M., Manz D., Schottle K., Ohlhausen P., Oosthuizen G., Palm D., Von Leipzig K. (2017) „Initialising customer-orientated digital transformation in enterprises." *Procedia Manufacturing* **8**: 517–524.

[234] Schwartz E.I. (2001) *"Digital Darwinism: 7 Breakthrough Business Strategies for Surviving the Cutthroat Web Economy."* Random House Inc., New York.

[235] The term refers to enterprises disappearing because their corporate internal business structure did not adapt and respond to technological trends in order to survive on the competitive international landscape.

[236] Kane G.C. (2015) "Winning the Digital War for Talent." *MIT Sloan Management Review* 58**(2)**: 17-19.

[237] Lucian P. (2018) "A few considerations regarding the strategy for the digital single market." *Revista Economica* 70**(2)**: 68-75.

[238] Ibd.

[239] Kerber W. (2016) *"Digital markets, data, and privacy: Competition law, consumer law, and data protection."* MAGKS Joint Discussion Paper Series in Economics. Philipps-University Marburg, School of Business and Economics, Marburg.

[240] Commission (2017a) "Digital Transformation Monitor. Key lessons from national industry 4.0 policy initiatives in Europe," accessed April 15, 2020, https://ec.europa.eu/growth/tools databases/dem/monitor/sites/default/files/DTM_Policy%20initiative%20comparison%20v1.pdf

### *5.3.1 Digital Transformation of Business*

The so far described nature of DT found in the literature further suggests that a degree of complexity exceeds previous IT-enabled transformations. This is supported by the fact that DT is one of the major challenges for Member States' industry transformation attempts throughout the past few years.[244] Although businesses operating in the European DM have acknowledged the paramount importance of DT, the majority is still facing multiple obstacles that inhibit them from initiating and benefiting from DT.[245]

Fitzgerald et. al. (2013) suggests that a significant minority of businesses have succeeded in developing the right managerial and technological skills to gain transformational effects from SMACIT since the employment of the new EU framework on digitalization.[246] Businesses struggle to gain benefits from new technologies, as competing priorities lead a list of common speed bumps before and even during DT.[247] Reasons for this arise from a lack of clarity about the different available options and elements that manager need to consider in their DT approach.[248] Among the classical leadership challenges are external, on the EU single market, innovation, fatigue, and political and legal barriers, and internal, in businesses, general resistance attitudes of (often old) workers, as well as, more specific, a lack of urgency, business vision, and direction.[249] Since these organizational-cultural barriers internal to businesses often are underestimated by managers, additional leadership and institutional challenges are faced for businesses, that aim to transform digitally.[250] Gronlund (2011) claims that there are only a few pieces of research on the relation between the modern IT-development and economic sector, and further, emphasizes the importance for regulators to pay attention to how the rapid IT-development will provide changes for the profession of businesses.[251] By breaking down barriers between people, businesses and things, DT is disrupting businesses in every industry and creates new products, services and efficient ways of doing business.[252] In order to compete and strive in the digital world, businesses need to integrate these digital technologies and their capabilities to transform processes, innovate, and engage in the market. Among businesses where mobile, cloud, big data and social technologies are an integral part of the business infrastructure, new technology achieves bigger market valuation than competitions without it and accordingly certain challenges are associated: First, business change occurs only when a company makes a transition from its current state to some desired future state. The managing of this change is thus a process of planning, minimizing employee resistance, and cost to the organization, while simultaneously maximizing the effectiveness of the change effort. Successful digital transformation goes hand in hand with reengineering and optimization of business processes. Without the necessary strategy, too many companies are focused on technology rather than on the customer. Therefore, it is necessary that organizational change, technology and data integration are addressed equally to achieve successful digital transformation of business. Thus, businesses must leverage strategy, culture, and leadership to harness the potential of digital business transformation and have to put equal focus on the following dimensions: (i) increase efficiency, (ii) improve customer experience, (iii) enhance decision-making, and (iv) transform their business to be more innovative compared to competition.[253]

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[241] Commission (2016) "Digitizing European Industry – catalogue of initiatives," accessed April 21, 2020, https://ec.europa.eu/futurium/en/content/digitising-european-industry-catalogue-initiatives

[242] Hess T. et. al. (2016) "Options for Formulating a Digital Transformation Strategy."

[243] Kerber W. (2016) "Digital markets, data, and privacy: Competition law, consumer law, and data protection."

[244] Schuchmann D. and Seufert S. (2015) "Corporate Learning in Times of Digital 34 Transformation: A Conceptual Framework and Service Portfolio for the Learning Function in Banking Organisations." *International Journal of Advanced Corporate Learning* 8(**1**): 31-40.

[245] Von Leipzig T. et. al. (2017) „Initialising customer-orientated digital transformation in enterprises."

[246] Fitzgerald M., Kruschwitz N., Bonnet D. and Welch M. (2013) "Embracing Digital Technology: A New Strategic Imperative." *MIT Sloan Management Review*: 01-12.

[247] Kane G.C., Palmer D., Phillips A.N., Kiron D. and Buckley N. (2015) „Strategy, Not Technology, Drives Digital Transformation." *MIT Sloan Management Review*: 01-25.

[248] Hess T. et. al. (2016) "Options for Formulating a Digital Transformation Strategy."

[249] Lawton L. (2015) "The Leader's role in managing change: Five cases of technology enabled business transformation." *Global Business and Organizational Excellence* (March-April): 28-42.

[250] Von Leipzig T. et. al. (2017) „Initializing customer-orientated digital transformation in enterprises."

[251] Granlund (2011) "Extending AIS research to management accounting and control issues: A research note." *International Journal of Accounting Information Systems* 12(**1**): 03-19.

### *5.3.2 Digitalization as Business Model Driver*

Throughout the ongoing Forth Industrial Revolution, digitalization and software have been inherently involved in businesses from its infancy,[254] shaping business strategies and structures as well as macro- and micro-level activities. Digitalization creates new opportunities for services, platforms, intelligent products, and novel business models.[255] While some businesses are still overcoming challenges of data collection, analytics, and warehousing, others have already fully digitalized and move towards autonomous solutions.[256] Thus, DT not only enables improvements and maintenance, but also more effective and efficient value creation for businesses.[257] With these rapid developments, businesses are required to quickly enforce technological innovation through new DT models. However, this DT towards digital business models seems far from easy, as implementation of new technologies may add complexities and create challenges for business making.[258] In order to allow for a better understanding of the complexity of DT, the following section will provide an overview of business model theory, before the thesis will introduce the case study of SAP in chapter 6. As it is, scholars increasingly view digitalization as value creation, value capture, enabler and driver of business models.[259] Business model theory is commonly understood as the integration point for different theories.[260] As the comprehensive unit, it revolves around the notion of value that align the same common goals in businesses and organizations.[261] An early scholarly attempt to define business transformation resulted in a two-dimensional concept that defines it as "a fundamental change in organizational logic that may result in a fundamental shift in behaviors."[262] Building on this broad definition, Muyzka et. al. (1995) developed a cluster for business transformation concept (of which the first three stages are illustrated in **Figure 3** in the appendix):

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[252] Schwertner K. (2017) “Digital Transformation of Business.”

[253] Ibd.

[254] Rabentino R. and Kohtamäki M. (2018) “Practices and tools for servitization: Managing service transition.” In: Kohtamäki M., Baines T., Rabentino R. and Bigdeli A.Z. (eds.) *To servitize is to reposition: Utilizing a Porterian review to understand servitization and value system.* London: Palgrave McMillan.

[255] Lerch C. and Gotsch M. (2015) “Digitalized product-service systems in manufacturing firms: A case study analysis.” *Research-Technology Management* 58**(5)**: 45-52.

[256] Parida V. et. al. (2019) “Reviewing literature on digitalization, business model innovation, and sustainable industry.”

[257] Mitchell D. and Coles C. (2003) “The ultimate competitive advantage of continuing business model innovation.” *Journal of Business Strategy* 24**(5)**: 15-21.

[258] Rabentino R. and Kohtamäki M. (2018) “Practices and tools for servitization: Managing service transition.”

[259] Parida V., Sjödin D.R. and Reim W. (2019) “Reviewing literature on digitalization, business model innovation, and sustainable industry: Past achievements and future promises.” *Sustainability* 11**(2)**: 1-18.

[260] Amit R. and Zott C. (2001) “Value creation in e-business.” *Strategic Management Journal* 22**(6/7)**: 493-520.

[261] Kurti E. and Haftor D.M. (2014) “The Role of Path Dependence in the Business Model Adaptation: From Traditional to Digital Business Models.” In: Mola L., Carugati A., Kokkinaki A. and Pouloudi N. (eds.) *Proceedings of the 8th Mediterranean Conference on Information Systems*. Verona, Italy.

- **Re-engineering:** refers to the improvement of business efficiency, while only partially encouraging a better engagement of the workforce
- **Restructuring:** refers to improving efficiency without necessarily improving the organization´s ability to achieve long-term goals
- **Renewing:** refers to gaining improved efficiency, effectiveness and innovation through employee empowerment without a clear focus on business goals
- **Regeneration:** refers to the improvement of existing processes and fundamentally revisiting the portfolio and direction of available opportunities[263]

All the above-mentioned types of transformation can create norm and behavior tensions between old competencies, present, and future challenges. Throughout the 1990s, business transformation was thus additionally linked to business strategy fields, with Prahalad and Oosterveld (1999) describing it as the invention of strategies and management processes that must be driven by a new concept.[264] According to this understanding, business transformation must involve the entire business and deal with deeply embedded business values and beliefs. Finally, the transformation must be coupled with a new management process, including performance evaluations, career management, product development, logistics, business structure and processes. Since technology has been identified as the key internal dimension aiding businesses in transforming,[265] innovation and transformation through business model has attracted enormous attention from both, practitioners and leading scholars.[266] The link between transformation to business strategy established in the 1990s, was then further refined by McKeown and Philip (2003), who emphasized DT as an overarching concept that encompasses a range of competitive strategies which organizations adopt in order to achieve improvements for the business performance. According to this view, DT strategies include business process re-engineering, business development, quality management, and the application and use of new advanced technology.[267]

### *5.3.3 IT-Enabled Transformation*

Business DT is often perceived as a change caused by ICTs,[268] whose transformational power usually exhibits in at least three of the following dimensions: processes, new organization, user experience, customers, relationships, markets, and disruption.[269] Many authors have thus established DT criteria for IT-enabled transformation. In this vein, Dehning et. al. (2003) suggest that ICTs are transformational if they alter traditional ways of doing business by redefining capabilities, relationships, and processes.[270] Because ICTs involve strategic acquisitions in order to acquire new capabilities or to enter a new market, the application of new technologies to a business is expected to change how tasks are carried out and enable businesses to operate in different markets, serve different customers, and to gain considerable competitive advantage.[271] Attempting to integrate the work of several authors on IT-enabled transformations, Morgan and Page (2008) proposed four phases through which businesses progress when transforming IT-relatedly. Each phase builds on another and they increase in offered risks and gains, as businesses advance through them. The phases consist of **adapting** the view and perception of the business and automating selected activities, **evolving** internal business configuration to allow more flexibility, **envisioning** the business along its value-chain alignment with marketplace opportunities where the business network process is redesigned, and finally, **renewing** where the business scope is reframed and solve people-based issues through internal skill improvement.[272]

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[262] McKeown I. and Philip G. (2003) "Business transformation, information technology and competitive strategies: Learning to fly." *International Journal of Information Management* 23**(1):** 3-24.

[263] Muzyka D., Program M.B.A. and Koning A.D.E. (1995) "On Transformation and Building the Entrepreneurial Corporation." *European Management Journal* 13**(4):** 346-362.

[264] Prahalad C.K. and Oosterveld J.P. (1999) "Transforming Internal Governance: The Challenge for Multinationals." *Sloan Management Review* 42**(2):** 31-39.

[265] Morgan R.E. and Page K. (2008) "Managing business transformation to deliver strategic agility." *Strategic Change* **17:** 155-168.

[266] Saebi T., Lien L. and Foss N.J. (2017) "What drives business model adaptation? The impact of opportunities, threats and strategic orientation." *Long range planning* 50**(5)**: 567-581.

[267] McKeown I. and Philip G. (2003) "Business transformation, information technology and competitive strategies."

[268] Venkatraman N. (1994) "It-Enabled Business Transformation - From Automation to Business Scope Redefinition." *Sloan Management Review* 35**(2):** 73-87.

[269] Lucas H.C., Agarwal J.R., Clemons E.K., El Sawy O.A. and Weber B. (2013) "Impactful Research on Transformational Information Technology: An Opportunity to inform new audiences." *MIS Quarterly* 37**(2):** 371-382.

#### *5.3.3.1 The Context of Digital Transformation: Why Do Companies Digitally Transform?*

This section recaps elaborations about the development of digitalization that was presented in the first chapter of the thesis and aims to examine the context of DT. By looking at previous IT-enabled transformations in the 1980s and 1990s, and contrasting them with digital ones, this section aims to explain why companies strive to digitally transform. As mentioned before, the strategic importance of integrating ICT to enable companies to gain and maintain a competitive advantage on the marketplace has already been recognized throughout the evolution of the Third Industrial Revolution.[273] It becomes clear that many drivers unfold when trying to conceptualize why companies digitally transform. These can also be divided into internal motivations and external triggers. Internal to the EU single market, the business environment focus has been on cost savings.[274] Thereof, operational drivers of transformation are linked to business' DT, in order to gain efficiency growth[275] or closely related to productivity improvements.[276] Moreover, businesses aspire to technological innovation[277] and competitive differentiation that DT delivers.[278] An increased emphasis has been put on achieving improved operational business efficiency and effectiveness through the management of ICT and a strategic differentiation from competitors.[279] Thus, internally businesses are motivated to transform themselves.[280] Businesses also strive to drive economic benefits for their stakeholders, with special emphasis on closer and more efficient interaction with the customers they serve.[281] Externally, and with the Forth Industrial Revolution proceeding, emerging technologies play a pivotal role as a trigger for DT.[282] Especially, the speed of digitalization with market-changing[283] and industry-disrupting potential[284] demands, that businesses quickly assemble their digital resources. Consequently, new IT-based products and services have emerged[285] and businesses have reaped the benefits of improvements in technology cost and performance.[286] Because of the increased connectivity enabled by new technologies, customers across all EU economies have completely changed their behavior in regard to what they expect from businesses.[287] Additionally, a common pressure for businesses to digitally keep up is also exerted from increased focused competition in our globalized world.[288] Observing the drivers found in the literature, it appeals that they converge together but cannot be strictly categorized as internal versus external concepts. However, transformation drivers may tend more towards one or the other contexts.[289]

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[270] Dehning B., Richardson V.J. and Zmud R.W. (2003) "The Value Relevance of Announcements of Transformational Information Technology Investments." *MIS Quarterly* 27**(4):** 637-656.

[271] Gouillart F. and Kelly J. (1995) *"Transforming the Organization."* McGraw-Hill: Maidenhead. Johnson.

[272] Morgan R.E. and Page K. (2008) "Managing business transformation."

[273] Raghunathan M. and Madey G.R. (1999) "A Firm-Level Framework for Planning Electronic Commerce Information Systems Infrastructure." *International Journal of Electronic Commerce* 4**(1):** 121-145.

[274] Noble F. (1995) "Implementation strategies for office systems." *Journal of Strategic Information Systems* 4**(3):** 239-253.

[275] Kane G.C. et. al. (2015) „Strategy, Not Technology, Drives Digital Transformation."

[276] Von Leipzig T. et. al. (2017) „Initializing customer-orientated digital transformation in enterprises."

[277] Hess T. et. al. (2016) "Options for Formulating a Digital Transformation Strategy."

[278] Berman S.J. (2012) "Digital transformation: Opportunities to create new business models." *Strategy & Leadership* 40**(2):** 16-24.

[279] Clark C.E., Cavanaugh N.C., Brown C.V. and Sambamurthy V. (1997) "Building Change-Readiness Capabilities in the IS Organization: Insights from the Bell Atlantic Experience." *MIS Quarterly* 21**(4):** 425-455.

[280] Andriole S.J. (2017) "Five Myths About Digital Transformation." *MIT Sloan Management Review* 58**(3):** 20-22.

[281] Kaufman I. and Horton C. (2015) "Digital Transformation: Leveraging Digital Technology."

[282] Chahal M. (2016) "The True Meaning of Digital Transformation." Marketing Week **(April):** 16-20.

[283] Kohli R. and Johnson S. (2011) "Digital Transformation in Latecomer Industries: CIO and CEO leadership lessons from Enacana Oil & Gas (USA) Inc." *MIS Quarterly Executive* 10**(4):** 141-156.

[284] Westerman G. et. al. (2014) „The Nine Elements of Digital Transformation."

#### *5.3.3.2 The Content of Digital Transformation: What are the Dimensions of Transformation?*

The last section looked at previous IT-enabled transformations and contrasted them with digital ones, in order to elaborate the context of DT. And as highlighted previously, ICTs initiated an excessive investigation of the potential of information systems and enabled business transformation.[290] This section will now move on to examine the content of DT by identifying dimensions of previous transformations.[291]

Venkatraman's (1994) highly cited paper on transformation levels sheds light on five dimensions with varying degrees of change and potential benefits.[292] The schematic framework of evolutionary and revolutionary levels has proven useful in comprehending the content of previous IT-enabled transformations. Revolutionary levels reap great benefits and involve a high degree of business change (i.e. new structuring activities or reporting mechanisms). Evolutionary levels, on the other hand, indicate marginal benefits that also entail lower degrees of complexity for change requirements. Looking at more recent papers on DT, a similar approach can be used to identify transformational dimensions in the digital age. As the proliferation of digital technologies has opened the door for new opportunities,[293] companies are enabled to create new business models.[294] However, since DT can either occur in form of modification of existing businesses or through the creation of entirely new digital business models, transformation varies in scale.[295] Therefore, Porter's (1991) classification of business value chain and value system framework to classify transformation dimensions captures various business activities in combination with the business value system. It complements the dimensions identified by Venkatraman (1993) with end-to-end business production and processes and end-customer downstream channels[296] and will be used in the following section when analyzing the case study of SAP and investigate the conceptual framework of DT (as displayed in **Figure 4** in the appendix). DT is much more than simply employing digital technologies.[297] On the one hand, the classical framework of Venkatraman (1994) that highlights five different transformational levels with varying degrees of change and potential

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[285] Ward J., Griffiths P. and Whitmore P. (1990) *"Strategic Planning for Information Systems."* Chichester: Wiley.

[286] Eisley N. and Ttang M. (1996) "The Middle Path: Dealing with Transformation in Asia's Information Technology Competitiveness Experience." *International Journal of Information Management* 16**(4)**: 253-276.

[287] Earley S. (2014) "The Digital Transformation: Staying Competitive.*" IT Pro* **(March/April)**: 58-60.

[288] Von Leipzig T., Gamp M., Manz D., Schottle K., Ohlhausen P., Oosthuizen G., Palm D., Von Leipzig K. (2017) „Initializing customer-orientated digital transformation in enterprises." *Procedia Manufacturing* **8**: 517–524.

[289] Ismail M.H. et. al. (2017) "Digital Business Transformation and Strategy: What Do We Know So Far?"

[290] Valdez-de-Leon O. and Christensen C. (2016) "A Digital Maturity Model for Telecommunications Service Providers.*" Technology Innovation Management Review* 6**(8)**: 19-32.

[291] Venkatraman N., Henderson J.C. and Oldach S. (1993) "Continuous strategic alignment: Exploiting information technology capabilities for competitive success." *European Management Journal* 11**(2)**: 139-149.

[292] Venkatraman N. (1994) "It-Enabled Business Transformation."

[293] Matt C. et. al. (2014) "Digital Transformation Strategies."

[294] Singh A. and Hess T. (2017) "How Chief Digital Officers Promote the Digital Transformation of their Companies." *MIS Quarterly Executive* **(March)**: 31-44.

[295] Daimler P.P. (2017) "Will digital boost circular? Evaluating the impact of the digital transformation on the shift towards a circular economy." *International Journal of Management Cases* **(January)**: 22-34.

[296] Venkatraman N. et. al. (1993) "Continuous strategic alignment."

[297] Kohnke O. (2017) "It´s Not Just About Technology: The People Side of Digitization." *Shaping the Digital Enterprise*: 69-91.

business benefits has been introduced.[298] Complementing this work, the rather conceptual approach of Porter (1991) about business value chain and value system framework seems beneficial, when aiming to identify additional business dimensions of DT.[299] Since digitalization is quickly changing the world and making of business, the work of Venkatraman (1994) and Porter (1991) needs to be updated. The Business Model Canvas of Osterwalder and Pigneur (2010) offers here a synthetization of the new need's businesses face due to digitalization as the case study introduced in the next chapter will illustrate. The model (**Figure 9** in the appendix) consists of nine building blocks that integrate the levels and areas of Venkatraman and Porter. Osterwalder and Pigneur (2010) integrate both approaches by defining their business strategy building blocks as: customer segments, value proposition, channels, customer relations, revenue streams, key resources, key activities, key partnerships, and cost structure that are supposed to guide businesses in their DT development and which relate to necessities for DT process of businesses as highlighted by the following section.[300]

#### *5.3.3.3 The Process of Digital Transformation: How do Businesses Formulate and Implement Their Digital Transformation Strategies?*

Faced with multiple challenges, businesses have come to recognize the need to govern the complex endeavor of DT by formulating and executing a clear strategy to keep pace with the new digital realty.[301] Business entrepreneurs are in agreement that the ability to digitally reinvent is not just about the technologies being adopted, but also implies strategic and cultural change within the business.[302] Corporate employees equally believe in the central role that strategy plays at successfully adopting new technologies.[303] In order to introduce the DT strategy and position it within the hierarchy of business strategies, it seems useful to identify the strategy hierarchy for each situation individually, since strategic choices can be tempered or restricted depending on the people involved at each DT level.[304] Major strategy levels of DT are presented in a general overview in **Figure 5** in the appendix. The literature accentuates between digital business strategy, digital transformation strategy, and IT strategies. Inherent to IT strategies are three dimensions, that typically concentrate on the IT scope, IT governance, and systemic competencies.[305] This emphasis results in a system-centered focus that regards focuses on products or consumers as hindering to the future use of technologies.[306] DT theories, on the other hand, apply a broader impact on businesses and allow for transformational opportunities with people and within products, processes and business models. Therefore, IT strategy knowledge cannot simply be transferred to a digital transformation context.[307] However, with digitalization accumulating in the rise of new digital products, processes and services, Bharadwaj et. al. (2013) define digital business strategies as an organizational strategy formulated and executed by leveraging digital resources to create business value. The authors consider such a strategy to revamp the functional role IT strategies take on, fused with a business focus.[308] Therefore, a digital business strategy operates as overarching and company-wide guide for businesses on their DT journey.[309] Although such a strategy determines the desired future business opportunities based on the integration and use of new digital technologies, it does not provide guidelines regarding the transformational steps needed to

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[298] Venkatraman N. (1994) "It-Enabled Business Transformation."

[299] Porter M.E. (1991) "Towards a Dynamic Theory of Strategy." *Strategic Management Journal* 12**(2)**: 95-117.

[300] Osterwalder A. and Pigneur Y. (2010) *"Business Model Generation."* John Wiley & Sons, Inc., Hoboken: New Jersey.

[301] Matt C. et. al. (2014) "Digital Transformation Strategies."

[302] Von Leipzig T. et. al. (2017) „Initializing customer-orientated digital transformation in enterprises."

[303] Fitzgerald M. et. al. (2013) "Embracing Digital Technology."

[304] Mills J., Platts K. and Gregory M. (1995) "A framework for the design of manufacturing strategy processes: A contingency approach." *International Journal of Operations & Production Management* 15**(4)**: 17-49.

[305] Venkatraman N. et. al. (1993) "Continuous strategic alignment."

[306] Matt C. et. al. (2014) "Digital Transformation Strategies."

[307] Hess T. et. al. (2016) "Options for Formulating a Digital Transformation Strategy."

[308] Bharadwaj A., El Sawy O.A., Pavlou P.A. and Venkatraman N. (2013) "Digital Business Strategy: Toward a next generation of insights." *MIS Quarterly* 37**(2)**: 471-482.

[309] Singh A. and Hess T. (2017) "How Chief Digital Officers Promote the Digital Transformation of their Companies."

reach the desired future state.[310] However, only when adding those characteristics with attitudes of business, digitalization can transform successfully.[311] As it will be further elaborated using the case study of SAP as illustrative example, DT dimensions also include digital activities and changes to products, services, and business models – thus going beyond companies' operational boundaries. Consequently, the scope of a digital business strategy needs to be broadly designed, in order to capture the broad range of transformation initiatives and progresses.[312] Because of the distinctive nature of a digital business strategy with its company-spanning characteristics and inclusiveness of all business segments there is a need to align it with other operational and functional strategies.[313] Moreover, DT implies changes in value creation that derive from the way in which the newly adopted technologies alter the old business model. Businesses are thus required to rethink their business scope and identify potential new revenue streams from digitally enhanced products, services, and customer interactions.[314] In order to ensure sustainable outcomes, businesses must take the integration of technologies with their core values and business goals into consideration.[315] The case study will further illustrate the necessary functional alignments that a digital transformation strategy needs to fulfill (as depicted in **Figure 6** in the appendix). The design of a DT strategy requires businesses to make appropriate strategic decisions in several key areas, which are summarized in **Figure 7** in the appendix. The content of such a strategy may thus be categorized according to the addressed business levels. By making a set of deliberate choices to meet long-term goals of the DT endeavor, strategic decision areas must be incorporated into the strategy formulation.[316] From the business level perspective, long-term business objectives need to be clearly defined and quick to gain. Those objectives are closely related to decision areas that assure change-readiness assessments, that enable a business to identify problems and opportunities, perform, and detect risks.[317]

Concerning the broad field of business model theory, scholars agree in defining a business model[318] as the process through which a company creates, captures value, and delivers in relation with its environment or network of exchange partners.[319] Starting from a very simple definition, a business model therefore combines the elements of `who´, `what´, `when´, `why´, `where´, `how´ and `how much´ in providing customers with products and services.[320] Thus, a business model's change process is characterized by a novelty to existent structures in the market[321] and may result in collective knowledge, increase firm survival[322], and is a source of business competitiveness.[323] Therefore, successful businesses must consider transformation as imperative to exploit new opportunities,[324] by applying new services or technologies, if they want to remain efficient, productive and competitive in the marketplace.[325] The literature shows evidences, that as a whole, business model change has several risks such as compromising quality and network and overall seems to underscore the need to provide tools and practices that help entrepreneurs to cope with business model transformation. Consequently, and since its infancy, the adoption of software (i.e. cloud service) as new technology has long been inadequately addressed by EU legislation. The case study of SAP that will be introduced in the next chapter provides evidence, that confirms the findings of this chapter, that the evolution of digitalization requires increasing emphasis beyond boundaries of single firms to align new business models and technologies within the ecosystem of a state and thus the EU as a whole. Namely, that business model transformation in digitalization cannot be considered without the context of a value system or economic dimension of the market the business operates on.[326]

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[310] Hess T. et. al. (2016) "Options for Formulating a Digital Transformation Strategy."

[311] Sebastian I.M., Ross J., Beath C., Mocker M., Moloney K. and Fonstad N. (2017) "How Big Old Companies Navigate Digital Transformation."*MIS Quarterly Executive* 16**(3)**: 197-213.

[312] Matt C. et. al. (2014) "Digital Transformation Strategies."

[313] Kaufman I. and Horton C. (2015) "Digital Transformation: Leveraging Digital Technology."

[314] Hess T. et. al. (2016) "Options for Formulating a Digital Transformation Strategy."

[315] Kaufman I. and Horton C. (2015) "Digital Transformation: Leveraging Digital Technology."

[316] Lawton L. (2015) "The Leader's role in managing change."

[317] Kaufman I. and Horton C. (2015) "Digital Transformation: Leveraging Digital Technology with Core Values to Achieve Sustainable Business Goals." *The European Financial Review* **(December/January)**: 63-67.

[318] Teece D.J. (2010) "Business models, business strategy and innovation." *Long range planning 43***(2/3)**: 172-194.

[319] Kulins C., Leonardy H. and Weber C. (2016) "A configurational approach in business model design." *Journal of Business Research* 69**(4)**: 1437-1441.

[320] Mitchell D. and Coles C. (2003) "The ultimate competitive advantage of continuing business model innovation."

[321] Massa L. and Tucci C.L. (2013) "Business model innovation." *The Oxford handbook of innovation management* 20**(18)**: 420-441.

[322] Greve H.R. (1998) "Performance, aspirations, and risky organizational change." *Administrative Science Quarterly* 43**(1)**: 58-86.

[323] Zott C., Amit R. and Massa L. (2011) "The business model: recent developments and future research." *Journal of Management* 37**(4)**: 1019-1042.

[324] McGrath R.G. (2010) "Business models: A discover driven approach." *Long range planning* 43**(2/3)**: 247-261.

# 6 SAP Societas Europea (SAP SE)

The economic effects of the DT manifest not only in the disruption of business structures, but also in job destruction (namely in the service sector), creation of new sectors while transforming old ones, emergence of new forms of work, and a reshaping of the trade landscape. Among the most innovative elements of digitalization are therefore capacities of machines to solve problems faster than before (AI), due to increased information captured by the system (machine learning), algorithms that compare machine performances (benchmarking), availability of data that helps to add value to a range of services and increases efficiency in managing supply chains (blockchain technology), and real time responding to customer needs (cloud service).[327] SAP provides therefore an example of a firm that has already implemented a new technology by following a changing market and new customer needs and will be introduced as the case study of this analysis. The name SAP stands for *Systeme, Applikationen, Produkte und Datenverarbeitung* and SE determines its status as *Societas Europea*. As a corporation of multinational scale, it produces enterprise software (mainly so-called Enterprise Resource Planning software, including cloud service) to manage business operations and customer relations for around 425.000 customers in over 180 countries worldwide. Previously, SAP specialized in so-called Enterprise Resource Planning (ERP) software. But with the changing digital landscape, customers increasingly demanded end-to-end processes and solutions for software, data banks, analysis and intelligent technologies for experience management. Thus, SAP specialized in the growing field of cloud computing and digitally transformed its service and became one of the world leading companies offering cloud solutions.[328] Findings from SAP´s business DT will serve to test the findings of the qualitative literature analysis provided in the previous chapter and be displayed in the following section.

Bill McDermott, CEO of SAP: *"SAP is the business process company, and this is how we will augment humanity to unleash a new breed of economic growth around the world. To do that, SAP will help you deliver the intelligent enterprise."*[329]

In the case of SAP, the implementation of new technology has propelled business model innovation that has challenged and extended the standard value chain in offering new products and services to the consumers. Consequently, digitization and processes opened many opportunities for the expansion of the business and for its internationalization in the economic sector. Players in the industry must also respond to fundamental consumer expectations around security and data privacy. For SAP, the ability to manage and secure consumer data is a challenge faced, that most other industries in the field are also challenged by.[330] SAP has acknowledged that the application of advanced technology would produce productivity gains. In general, productivity measures the level by which an economic system organizes inputs to generate outputs. The most common indicator is the productivity of an hour worked, which is the quantity of output produced per hour. An increase in productivity combined with stable or lower labor costs therefore allows businesses to keep their production process growing steadily. Additionally, these dynamics can have a positive impact on employment, which is predominantly evident in Western countries. In the case of SAP these productivity gains have been recognized early on.[331] Since businesses in the industry must also respond to fundamental consumer expectations around security and data privacy, while compelling and supporting customer processes and products, SAP has started to align its business model to cloud computing needs. The adoption of cloud service has thus transformed its whole business towards a greater emphasize onto digital structures and processes.[332] SAP has tried to create more value for customers by enhancing interaction with partners, changing its corporate culture, and changing its organization and processes to digital transformation.[333]

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[325] Achtenhagen L., Melin L. and Naldi L. (2013) "Dynamics of Business Models – Strategizing, Critical Capabilities and Activities for Sustained Value Creation." *Long Range Planning* 46(6): 427-442.

[326] Doz Y.L. and Kosonen M. (2010) "Embedding strategic agility: A leadership agenda for accelerating business model renewal." *Long range planning* 43(2/3): 370-382.

[327] Commission (2019b) "Shaping Europe´s digital future."

[328] SAP (2019) "Über SAP SE," accessed July 11, 2020, https://www.sap.com/corporate/de.html

[329] Galer S. (2018) „SAP CEO Bill McDermott Explains How Intelligence Revolutionizes," accessed June 18, 2020, https://www.forbes.com/sites/sap/2018/06/11/sap-ceo-bill-mcdermott-explains-how-intelligence-revolutionizes-the-customer-experience/#3e6896fb6dc1

> SAP Business Practitioner: *"Whenever talking about digitalization, customers are considered. However, internally there is always room for improvement and more digitalization can be implemented."*

By acknowledging that some business strategies and goals need to undergo DT, SAP has therefore managed to align its business model digitally with a strict focus on customer demands.[334]

## 6.1 Empirical Findings: Digital Business Transformation Dimensions identified for SAP SE

In this chapter, the main findings of the case study will be presented. The findings form the basis for answering the research question: *"How well does the European Digital Single Market Strategy and the Industry 4.0 Framework afford Digitalization Transformation? A Case Study of SAP SE"* and provide evidence for the following four major findings:

(a) Digitalization throughout the Forth Industrial Revolution has been fueled by the development of advanced technologies that inspired new customer demands, which ultimately encourage the process of DT in businesses.
(b) The findings of the case study suggest, that DT can be captured when identifying distinctive business dimensions, namely customer, process, product and ecosystem dimensions.
(c) Business processes and operations with multiple impacts require fundamental redesign and interact with the external market. This raises issues of data security and privacy concerns that are not captured by the DSM and the German Industry 4.0 frameworks.
(d) The satisfaction of customers has the biggest impact crossing business boundaries and requires the redefinition of business scope and business model transformation that is not (yet) accurately captured by the DSM framework.

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[330] Ibd.
[331] Rüßmann M. et. al. (2015) "Industry 4.0: The Future of Productivity and Growth in Manufacturing Industries."
[332] OECD (2017) "Digital Economy Outlook 2017."
[333] Achtenhagen L. et. al. (2013) "Dynamics of Business Models."
[334] Pechardscheck S. (2019) "In Cloud we trust?" accessed May 30, 2020, https://www.bearingpoint.com/de-de/unser-erfolg/thought-leadership/in-cloud-we-trust

Analyzing the content of DT through the case study of SAP by shading light on distinctive DT features through the presentation of empirical findings will allow to position the phenomenon of DT (as illustrated in **Figure 8** in the appendix). DT features (as specified in the previous chapter) relate to business segmentation, customer relationship solutions with specific information requirements (data), global customer access (cloud services) and purchases. They resonate in SAP´s White Paper on Digital Transformation that defines DT as a set of (i) business model, (ii) organizational structure, (iii) digital skills of employees, (iv) digitalization of business processes, (v) IT infrastructure, (vi) digitization of products/services, (vii) digital channels for interactions with clients. The following sections of this chapter will proceed to introduce the data analysis, that will focus on how SAP has tried to create more value for customers by enhancing interaction with partners, changing its corporate culture, and changing its organization and processes to DT. On basis of the findings, this chapter unfolds into four sections. The first describes the customer dimension of DT, the second the process dimension, the third the product dimension and the fourth and final section will elaborate on the European digital single market ecosystem external, in which businesses across the EU operate.[335]

The analysis extended the findings of the interviews with an economic dimension of the EU single market, because the findings regarding digital business transformation cannot be analyzed without the background of the market that ensures conformity with the law and a fair competition environment.[336] Based on the Business Model Canvas of Osterwalder and Pigneur (1991) as provided in **Figure 9** in the appendix, this chapter aims to provide a theoretical framework (as displayed in **Figure 10** in the appendix) that helps structuring the context, process, content, and strategy of DT as found by the investigation of the case of SAP. The investigations of DT have elaborated on the case study of SAP, in order to provide a business point of view that can offer a comprehensive overview of strategic implications of DT in praxis. This will be accomplished by investigating the case study on micro-level (business internal) and macro-level (business external). Internally, through conducted interviews with business practitioners, various key decision areas for the making of business will be identified for SAP. This micro-perspective allows to understand and investigate the concept of DT based upon the Business Canvas Model and emphasize it from a strategic lenses in relation to the business external market, consisting of the ecosystem of the EU digital single market (thereby complementing the analysis with a macro-level perspective).[337] An illustrative mapping of the data analysis will provide for a better understanding of how SAP digitally transformed itself and forms the basis for answering, whether these practical dimensions fall into the scope of the DSM and the Industry 4.0 framework. The answering of the research question will thus be considered by comparing the case study result mapping with the qualitative literature analysis of the regulatory frameworks (**Table 3** in the appendix).

### *6.1.1 The Customer Dimension*

In the following four subsections, it will be presented how the interview participants determine digitalization and how they define the meaning of DT. Subsequently, it will be presented what respondents recognize as key drivers for successful DT and what influences their work and business. In order to do this, the data was compiled from the participants. The highest goal of digital transformation found by the analysis and interviews is greater inclusion of customers in company processes, often via a digital platform. This creates a business atmosphere where customers are perceived as partners on the one hand, and provisions of internal infrastructure and services are aligned with customer wishes on the other hand.[338] In accordance to the Business Canvas Model of Osterwalder and Pigneur (2010) as displayed in **Figure 9** in the

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[335] Sebastian I.M. et. al. (2017) "How Big Old Companies Navigate Digital Transformation."

[336] Ibd.

[337] Ismail M.H. et. al. (2017) "Digital Business Transformation and Strategy: What Do We Know So Far?"

[338] Ivancic L. et. al. (2019) "Mastering the Digital Transformation Process."

appendix, customers comprise the heart of any business model, because without profitable customers, no company can survive. In order to better satisfy customers, a business may group them into distinct customer segment blocks, that define the different people or organizations, the business aims to reach and serve.[339] According to the nature of its business, operational outcomes in the case study were considered as a combination of customer journey design with technologies implemented to speed-up end-to-end customer-related processes. In the case of SAP, customer relation management (CRM) reoriented SAP´s entire business internal supply chain to customer experience.[340] Thus, although applied rather late compared to other businesses in the field, the end-to-end customer journey became key guide for the design of digital solutions and transformation of business model.[341]

> Bill McDermott, CEO of SAP: *"Integration fuels intelligence. It's time to reimagine end-to-end mega processes in a new suite experience for the enterprise, [...] By connecting demand chain to supply chain, we help every part of the business serve and retain the customer."*[342]

Most of the respondents explained digitalization rather short, consistent or not at all, while a few informants elaborated more in-depth by connecting the question to other themes. Still, most respondents claimed that digitalization was about converting analog to digital systems and increasing business productivity by making processes more effective and automated. The Siemens business practitioner when asked about the meaning of digitalization for European businesses answered:

> *"Digitalization heavily influences and changes the industry, which helps to increase efficiency and effectiveness in established process and providing opportunities for new business models. I would describe the main changes as: hyper connected (i.e. more connectivity on IoT improves production), smart solutions (i.e. new technologies such as smart cars or intelligent systems) & autonomous (i.e. independent business value chains or autonomous production systems)."*

When asked about challenges and barriers they see in the process of DT following from digitalization, the same respondent explained:

> *"A first set of challenges relate to the disruptions digitalization enforces on the "traditional industry", relates to the greater use of IoT and digitalization, for which the EU workforce is not yet adequately digitally trained and educated. This also relates to business internal corporate cultures that are transforming and allow for new digital business models to develop as businesses increasingly consider the changing ecosystem of the EU Digital Single Market. Another set of issues relates to the greater connectivity achieved by digitalization, as with the increasing amount of data being deployed and used to added value, subsequently the need to secure, store and accurately transfer it increases."*

On the contrary, respondents from SAP put more emphasize on the connection of digitalization to the customer dimension of DT. Therefore, quality of service provision was found to be the most prominent consideration for SAP´s business model. One SAP employee stated:

> "*I would assume that with the time, the customer´s involvement and transformative strategy has changes as follows: customer success is one of our focus and we still improve our strategy regarding customer's needs. Therefore, we are constantly improving our processes."*

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[339] Osterwalder A. and Pigneur Y. (2010) "Business Model Generation."
[340] Galer S. (2018) „SAP CEO Bill McDermott Explains How Intelligence Revolutionizes."
[341] Ivancic L. et. al. (2019) "Mastering the Digital Transformation Process."
[342] Galer S. (2018) „SAP CEO Bill McDermott Explains How Intelligence Revolutionizes."

Besides, another SAP employee explained that the internal business making always considers customers for improvements of efficiency and productivity as a key driver of DT:

> *"Whenever talking about digitalization, customers are considered. I consider two relevant aspects here. On the one side, SAP business highly invests into gaining a holistic view onto customer needs and binding "customers for life". On the other side, SAP´s digital transformation aims to pressures on margins, reduce operational costs, use intelligent tools and increasingly implement new technologies."*

Although some literature emphasizes the relevance of DT strategy,[343] the quotation specifies that digital ambition in regard to a focus on customer needs was a more important factor for successful transformation that businesses should focus on utilizing, since the ultimate goal is to "digital" institutionalize the company setup along with customer's needs. This is captured under the customer dimension. The findings of the importance of the customer dimension to business making and transformation is also supported by other literature.[344] Nevertheless, digital strategy enhancement was found to provide a good starting point for digital transformation processes, that is captured below under the process dimension, that relates to the previous dimension. As it is necessary for companies to make conscious decisions about which customer segments to serve and which segments to replace or ignore, SAP grouped its business internal customer dimension on the distinctive segments of customer needs, common behaviors, and other contributions. Further, one SAP employee, when asked how DT with a focus on the customer dimension may change the company over time, summarized with:

> *"Over time there will of course be new products and services. At the heart of any good business strategy, after applying new technology, products or services, customer engagement should improve over time. When thinking about the dimension of customer engagement as part of SAP´s digital transformation, this is shown by the fact that customers increasingly expect to engage digitally with SAP (i.e. initiative SAP FOR ME where customers can access on individualized webpage about products and services)."*

According to Osterwalder and Pigneur (2010), once a company has made a final decision on how to group and define its customer dimension, a new DT model can carefully be designed.[345] From the observations it can be recognized that DT in combination with a customer focus is a tool for businesses to make themselves more productive and efficient. Overall, most respondents explained that the focus on the customer dimension is the key driver of SAP´s DT and directly links to the other three dimensions of products, processes and the business external ecosystem of the digital single market. Altogether, SAP´s DT seem to have been predominantly guided by customer needs, which created new internal value chains (within the process dimension) with focus on the implementation of new products and services (captured in the product dimension), while having in mind distinctive market characteristics of the EU single market (referring to the ecosystem dimension).[346] In general, but even more in cases of mass markets and multi-sided platforms such as cloud services operate on, as it will be elaborated within the next section, the success of the formulation of a DT model is ultimately linked to the strong understanding of specific customer needs.[347]

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[343] Hess T. et. al. (2016) "Options for Formulating a Digital Transformation Strategy."

[344] Kane G.C. et. al. (2015) „Strategy, Not Technology, Drives Digital Transformation."

[345] Osterwalder A. and Pigneur Y. (2010) "Business Model Generation."

[346] Ivancic L., Vuksic V.B. and Spremic M. (2019) "Mastering the Digital Transformation Process: Business Practices and Lessons Learned." *Technology Innovation Management Review* 9(2): 36-50.

[347] Osterwalder A. and Pigneur Y. (2010) "Business Model Generation."

### *6.1.2 The Process Dimension*

Most businesses constantly streamline their internal business processes in order to increase productivity and efficiency. Additionally, to the customer dimension, aspects of innovation become relevant through the application of new technology.[348] This is captured under the process dimension, because the means and resources, that enable innovative generation and management, encompass how the product portfolio of businesses is delivered to the customers. One SAP practitioner summarized this process dimension of SAP as follows:

> *"For the implementation of digital processes, a certain degree of standardization of processes is needed, as well as process redesign to a certain degree. Thus, for us standardization is important because it enables to enforce business processes in a digital format without any bypassing (i.e. data tracking, ensure high data quality), which in turn customers also benefit from."*

One interview participant of SAP stated that its digital business model with supply chain features and standardized internal business processes is relatively new:

> *"Although SAP´s business is located in the IT industry, its digital business model is relatively new. For instance, business supply chain features are still rather manual and not yet digitalized. Thus, the internal rate is rather inefficient and SAP´s operating model still has many areas that can be improved. Here the cloud business is just starting to help satisfying special customer demands and can for instance help to achieve more elasticity."*

Alongside the adoption of new products and services, the expert interviews with employees of SAP revealed, that the firm focusses on the need for quality enterprise resource planning (ERP) in the background and undertakes efforts to standardize business processes. The process of digitalization thus called the business to revise and standardize processes in terms of workflow, but also in terminology. Precisely, having in mind the service aspects of SAP with dedication to customer needs, the diverse portfolio of products and sales channels had to adapt new business processes.

> SAP Business Practitioner: *"It is very important that business processes, revenues and operations are clustered and work together in a streamlined way to achieve successful digital transformation. SAP´s corporate functions relating to cloud service is yet only sub-optimal designed, because finance controlling mechanisms need to be in place from a rather early stage on. Here a lot more development in the supply-chain area can be made in the future."*

Likewise, team leaders and managers have put considerable effort into employee motivation and education about the harmonization of process nomenclature, so that products would be offered under the right name and correct processes to customers. In addition to that, the analysis found that an efficient ERP system, that was running in the business background of SAP, joined utilized digital technologies into one holistic business system and empowered a more efficient and transparent information flow.[349]

### *6.1.3 The Products Dimension*

In line with the value proposition building block of Osterwalder and Pigneur´ s (2010) Business Model Canvas, products and services offered by a business create value for the specific customer dimension of the DT model. Since value creation is the reason why customers turn to one business or another, companies must develop their product portfolio according to a careful mix of elements. These may be quantitative (i.e. price, speed of service) or qualitative (e.g. design, customer experience).[350] As such, incumbent digital technologies were observed according to the strength of affiliation with traditional corporate governance structures inherent in the micro-level of SAP´s business.

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[348] Aspiron P.M., Schneider B. and Grimberg F. (2018) "ERP Systems Towards Digital Transformation." *Business Information Systems and Technology 4.0* **141**: 15-29.

[349] Ivancic L. et. al. (2019) "Mastering the Digital Transformation Process."

> SAP Business Practitioner: *"Currently, SAP´s digital transformation projects are all focused on internal businesses making with a focus on the implementation of new digital products and services (i.e. the integration platform HANA that combines different sorts of software's."*

Moreover, some respondents highlighted how crucial the implementation of new technology was for the successful DT of SAP:

> *"The shift towards cloud service has been transformational for SAP, because rather than the single tended and essential service version the previous on-prem service has provided for, SAP can now offer platform solutions, where customers pay on a "as you go" manner. But there are many other areas that need to be transformed as well."*

The quotations show that SAP´s adoption of new technology in form of cloud service followed the coping with constant business change that comes along with a process of digital transformation and the focus on customer needs.[351] As such, businesses have the option to choose from a pool of abundant modern technologies, depending on the digitalization areas they are focused on.[352] As it turned out for the case study of SAP, the firm does not excel in all implementation areas and neither does the firm have the urge to do so.[353] Rather, the constant focus on customer needs leads to the application of cloud service and thus became integral part of the new transformation process towards a new digital business model. By tailoring its products and services to the specific needs of individual customers, SAP has thus specified its internal value chains, while still taking advantage of economies of scale by interacting on the EU single market. An approach that academia is referring to as customization and is displayed in this chapter by providing the interconnected findings of detected DT dimensions.[354]

#### *6.3.3.1 Cloud Service Ecosystem*

As pointed out by the product dimension section above, advanced technologies can significantly affect businesses' DT, among which a few have the convergent forces of digitalization and revolutionary impact of scale for radical transformations of European Member States' economies. Namely, cloud computing, data analytics, social networks and new mobile devices have created new customer products and service demands that provide the foundation for the DT of platforms and businesses. Over the last few years, cloud technologies have been developing extremely rapidly. Forecasts predict that by 2025 almost all IT business solutions will be realized in clouds and the technology will also be used in the public sector.[355] Computing "in the cloud" has thus quickly developed as part of every-days business-making, such as the case study of SAP illustratively provides.[356]

> SAP Business Practitioner: *"In the past, when SAP´s business focus was mainly on licensing own software in one-time deals, possibilities to react to customers' demands*

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[350] Ibd.

[351] Spremic M. (2017) "Governing digital technology – how mature IT governance can help in digital transformation?" *International Journal of Economics and Management Systems* 2(**1**): 214-223.

[352] Ivancic L. et. al. (2019) "Mastering the Digital Transformation Process."

[353] Westerman G., Bonnet D. and McAffee A. (2012) "The Digital Capabilities Your Company Needs." *MIT Sloan Management Review:* 01-05.

[354] Osterwalder A. and Pigneur Y. (2010) "Business Model Generation."

[355] Bradley J., James L., Macaulay J., Noronha A. and Wade M. *"Digital Vortex. How Digital Disruption is Redefining Industries"* accessed April 24, 2020, http://www.cisco.com/c/dam/en/us/solutions/collateral/indstry-solutions/digital-vortex-report.pdf

[356] Morningstar Law Group (2018) *"The Laws of Cloud Computing: Weathering the Storms of Cyberpiracy, Hacking and IP Infringement"* accessed May 29, 2020, https://morningstarlawgroup.com/insights/cloud-computing-legal-issues/

> *were limited (i.e. stepping back from the deal was not possible under previous software business terms). Contrary to software contracts, customers now with SAP´s cloud service can cancel contracts and even switch over to a competitor without any major negative impacts. And therefore, the need for SAP to fulfill customer demands is higher in cloud service than before."*

This transformation from product to a service-based economy as byproduct of the ongoing digitalization means, that businesses need to become software service providers as well as consumers. In this context, cloud service enables greater agility for businesses, by making IT infrastructure more flexible. Accordingly, the software industry has evolved from software on the shelf-based applications deployed in dedicated services into software as a service based on components running on public or private clouds.[357] In this context cloud computing refers to both the application delivered as service over the Internet, as well as the hardware and system software in datacenters, that provide those services and have already caused major transformation in technologies and paradigm shift in business operations focus. The datacenter hardware and software are understood as the cloud.[358] The intermediate service of cloud computing has increased availability and use of relatively stable and accessible mobile connectivity platforms. With the rapid explosion of cloud-based commerce, elasticity and scalability of IT-systems have improved.[359] Accordingly, businesses must comply with data protection regulatory requirements of federal government frameworks (such as the German Industry 4.0 Regulation and EU legislation provided for in the DSM and more specifically in the GDPR), in order to take advantage of this new shift in service delivery cloud computing offers.[360]

Working with many cloud service providers for the EU means to manage and regulate multiple relationships within the ecosystem of the European digital single market. As most businesses are already negotiating on a one-to-one-bases, multiple contracts with multiple cloud service providers become interwoven and the many contracts mean multiple communication channels, payments, passwords, data streams, interfaces, and complicated field regulators must be checked up on. With so much activity implementing new or additional front-end and back-end applications for public and private clouds, legislative compliance needs to define the means of service with the legislations of EU countries in order to avoid constrains with legal requirements such as data protection, location, privacy and security. Moreover, as it will be stressed throughout the following sections, a big challenge arising from clouds concern the development of methods and interfaces, that ensure legislation compliance even cross-border in a legislative heterogenous environment as the digital single market. It thus has become time to make the EU´s marketplace fit for the digital age, which includes to tear down regulatory walls, remove existing online barriers, that make citizens miss out on goods and services, businesses and government not fully benefit from digital tools, and it needs a move from 27 national Member State markets to a single one. As it will be proposed in a final chapter of this analysis, the next step to achieve this goal is by resolving the gaps of the DSM and Industry 4.0 framework mentioned in Table 3 in a previous section. By doing so, regulators could start to implement the policy framework presented in this paper in order to achieve validation for the digital transformation of the EU economy, backed up with validation of real-life industry and public administration scenarios.[361]

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[357] Ibarra J.A., Orue-Echevarria L., Escalante M. and Benguria G. (2016) "Empowering service based software in the Digital single Market to foster an ecosystem of trusted interoperable and legally compliant cloud services" accessed 21 June, 2020, https://www.scitepress.org/Papers/2016/58933/58933.pdf

[358] Krishnan S. and Chen L. (2014) "Legal Concerns and Challenges in Cloud Computing."

[359] Tahamtan A., Beheshti S.A., Anjomshoaa A. and Tjoa A.M. (2012) "A Cloud Repository and Discovery Framework Based on a Unified Business and Cloud Service Ontology." *IEEE Eight World Congress on Services Discussion Paper* 2012: 203-210.

[360] Morningstar Law Group (2018) "The Laws of Cloud Computing: Weathering the Storms of Cyberpiracy, Hacking and IP Infringement."

[361] Ibarra J.A. et. al. (2016) "Empowering service-based software in the Digital single Market."

### *6.3.3.2 Cloud Technology, Models and Services*

Like most technical concepts, defining cloud computing is fraught with difficulties and controversies. However, out of the many definitions available for cloud computing and for the purpose of this analysis, cloud computing will be defined as a large pool of easily usable and accessible virtualized resources (such as hardware, development platforms, and other services). These resources can in turn be dynamically re-configured to adjust to a variable scale that allows businesses to optimize resource utilization.[362]

According to Foster et. al. (2008: 02) "cloud computing is a large scale distributed computing paradigm that is driven by economies of scale, in which a pool of abstracted virtualized, dynamically-scalable, managed computer power storage, platforms, and services are delivered on demand to external customers over the Internet."[363] Viewed from this perspective, cloud offers a set of different technologies and service models that focus on the delivery of application, offer data storage and memory space on an Internet-based use[364] (including capacities for further data proceedings).[365] A more technical and widely cited definition offered by the United States National Institute of Standardization and Technology (NIST) considers cloud service to purchase computing resources (i.e. digital storage space or computing capacity) on an a pay-per-use basis in which guarantees are offered by the infrastructure provider and become accessible from almost any location. This definition views cloud service as a model that enables on-demand network access to a shared pool of configurable computing resources that can be accessed rapidly by cloud providers and released by businesses with minimal management efforts.[366] Accessing cloud service for customers requires subscription fees that need to be payed per service. Thus, the service model of cloud computing can be defined as a network of virtual computers that are hosted outside of firewalls[367] and cater demands in terms of increasing capacity and features that simultaneously allow businesses to decrease costs.[368]

However, whatever definition is considered, cloud providers' features, such as virtualization, scalability and demand service, offer advantages for both, the end users and businesses.[369] The rather high-level ontology for cloud service offered by most scholars distinguishes cloud as as either Hardware as Service (HaaS), infrastructure of cloud application combined with Software as a Service (SaaS) or cloud software environment through Platform as a Service (PaaS).[370] Since this work for the purpose of research and within the scope of the case study of SAP covers only the delivery model of cloud computing, the ontology used was adapted from Foster et. al. (2008)[371] and modeled from the definition of NIST.[372] This ontology is believed to be more comprehensive, in depth and provides for querying possibilities. This allows to unify the cloud ontology with business function ontology and provides a mapping between business functions and cloud services.[373] The definition provided not only can serve as a service repository for businesses, but also helps to address issues such as description of cloud services, their flexibility, exchangeability and regulatory issues.[374] As cloud services are typically paid on a monthly basis or based on use with little or no upfront costs, businesses benefit from the predictability of service costs and the convenient on-demand network access to a shared pool of configurable computing resources,[375] which reduces expenses as well as efforts for staff.[376] The services enable organizations to benefit from the best technologies without making any initial costs, as cloud model businesses only pay for actual use rather than maximum one.[377] Among the essential characteristics of cloud computing services is the opportunity for **on-demand self-service** which allows users to acquire more computing resources without human interaction with the cloud service provider; **rapid elasticity** that allows users to quickly acquire and release computing resources; **broad network access** through which users gain the ability to access computing resources when, where and how they want; **resource pooling** that provides users with the capacities from sets of computing resources that may be "pooled" without the user having knowledge of how the pool is constructed and from where computing resources are coming from; as well as the **measure of service** which provides both, cloud provider and user with visibility about the amount of resources being used.[378] Accordingly, businesses get results from cloud computing as quickly as their programs can scale, due to the elasticity of resources cloud service offers.[379]

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[362] Kerrigan M., Mocan A., Tanler M. and Fensel D. (2007) *"The web service modeling toolkit – an integrated development environment for semantic web service."* In: Franconi E., Kifer M., May W. (eds) "The Semantic Web: Research and Applications." Lecture Notes in Computer Science 4519. Springer: Berlin/Heidelberg.

[363] Foster I., Zhao Y., Raicu I. and Lu S. (2008) "Cloud computing and grid computing 360-degree compared." *Proceedings of IEEE Grid Computing Environments Workshop:* 01-10.

[364] Ibd.

[365] Article 29 Working Party Opinion 10/2006 *"On the processing of personal data by the Society for Worldwide Interbank Financial Telecommunication (SWIFT), WP128 (2006)"* accessed May 29, 2020, https://ec.europa.eu/justice/article-29/press-material/press-release/art29_press_material/2006/pr_swift_affair_23_11_06_en.pdf

[366] Mell P. and Grance T. (2019) "*The NIST Definition of Cloud Computing*" accessed May 29, 2020, http://csrc.nist.gov/publications/nistpubs/800-145/SP800-145.pdf

[367] Gleb B. (2020) "Choosing the Right Cloud Service: Iaas, PaaS, or SaaS," accessed 23 July, 2020, https://rubygarage.org/blog/iaas-vs-paas-vs-saas

[368] Krishnan S. and Chen L. (2014) "Legal Concerns and Challenges in Cloud Computing."

[369] Hayes B. (2008) "Cloud computing." *Communications of the ACM* 51**(7):** 09-11.

[370] IBM (2020) "IaaS, PaaS, und SaaS – IBM Cloud-Servicemodelle," accessed 23 July, 2020, https://www.ibm.com/de-de/cloud/learn/iaas-paas-saas

[371] Foster I. et. al. (2008) "Cloud computing and grid computing 360-degree compared."

[372] Mell P. and Grance T. (2019) *"The NIST Definition of Cloud Computing."*

As mentioned above, cloud models are to be distinguished between three different service models, namely *Software as Service (SaaS), Infrastructure as a Service (IaaS),* and *Platform as a Service (PaaS). Software as a Service (SaaS)* refers to the provision of using cloud service provider applications (software) that runs on a cloud infrastructure and are displayed in an overlook within **Figure 11** below. In this service, a customer accesses a cloud provider´s application that is running on a cloud infrastructure. Thus, these applications are configured to suit consumer preferences, because the applications are frequently accessible through customized methods and allows accessibility from various devices (i.e. web-based) through the Internet.[380] However, generally in SaaS offerings customers do not have access to underlying details like servers, file storage or operating systems, which may help some to outsource the responsibility of monitoring and maintaining the resources that power their applications.[381] *Platform as a Service (PaaS)* offers the capability to deploy cloud infrastructure. Applications that the cloud provider offers as programs and support tools (i.e. centralized analysis of MRI scans or X-rays build on Microsoft Azure)[382] can be used to build an application. PaaS infrastructure provides customers with access to versions of its database platform and various other software that can help to tie parts of the cloud items together.[383] Finally, *Infrastructure as a Service (IaaS)* provides to process, store, access networks, or other fundamental computing resources on infrastructure that cloud service provider may want to offer.[384] One fundamental consequence of this is that the service consumer does not manage or control the underlying cloud infrastructure, including the network, servers, operating systems or storage, but may have control over the applications and configuration settings for the application-hosting environment.[385] Dropbox and Amazon are well-known providers that offer these kinds of services. Like the other services, IaaS leaves end users with most responsibility for data storage and security. In other words, end users are mostly still made accountable for licensing, updating and patching of any additional software that runs on the infrastructure.[386] Furthermore, the above-mentioned service models can be deployed by businesses in four possible ways into cloud usage models that differentiate in their provision of cloud service.

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[373] Ma Y., Jang S. and Lee J. (2010) "Ontology-based resource management for cloud computing." *Asian Conference on Intelligent Information and Database Systems:* 343-352.

[374] Tahamtan A. et. al. (2012) "A Cloud Repository and Discovery Framework Based on a Unified Business and Cloud Service Ontology."

[375] IBM (2020) "IaaS, PaaS, und SaaS – IBM Cloud-Servicemodelle."

[376] Bradley J. et. al. "Digital Vortex. How Digital Disruption is Redefining Industries."

[377] Schwertner K. (2017) "Digital Transformation of Business."

[378] Mell P. and Grance T. "*The NIST Definition of Cloud Computing*."

[379] Armbrust M. et. al. "Above the Clouds: A Berkeley View of Cloud Computing."

[380] Mell P. and Grance T. "*The NIST Definition of Cloud Computing*."

[381] Morningstar Law Group (2018) "The Laws of Cloud Computing: Weathering the Storms of Cyberpiracy, Hacking and IP Infringement."

[382] Mell P. and Grance T. "*The NIST Definition of Cloud Computing*."

[383] Morningstar Law Group (2018) "The Laws of Cloud Computing: Weathering the Storms of Cyberpiracy, Hacking and IP Infringement."

[384] Mell P. and Grance T. "*The NIST Definition of Cloud Computing*."

- *Private clouds* are infrastructures provisioned for exclusive use by a single organization or business. They are not publicly accessible but only open to an authorized group of users (i.e. company employees, customers or suppliers). Thus, private clouds can be either owned, managed and operated by the same, a third party, or some combination of them. Similarly, the data center in private clouds may be hosted on or off premises from the cloud consumers.[387] Private cloud models thus allow businesses and organizations to buy, build and manage their own infrastructure. From an economic perspective these terms may bring cost efficiency for businesses.[388] And from a legal point of view the greater IT and data security is often preferred by businesses for security purposes.[389]

- *Community clouds* also provide exclusive use and only differ from private clouds because they are offered to specific consumers.[390] This may regard businesses that share concerns due related to their internal business strategy, security requirements, policy and compliance considerations.[391]

- *Public clouds* provision their cloud infrastructure for open use to the general public. Their services are thus openly accessible to every user via the Internet.[392] Public clouds can be managed or owned by either a business or organization and its data centers exist on the premises of the provider.[393] Examples of public clouds are for instance the Google Doc services or paid ones like Microsoft Office 365.[394]

- *Hybrid clouds* are composition of two or more distinct cloud infrastructures (namely either private, community or public clouds) which remain separate entities bound together by technology.[395] Through hybrid infrastructure, data and application become portable in the cloud.[396]

As elaborated on above, the distinctive forms of cloud supply chains provide many components and service options from different suppliers or providers. Additionally, businesses can involve multiple service models in the layers of their cloud ecosystem that may even be owned by third parties that only provide the physical space for data centers.[397] Considering all the possible benefits of cloud service, it comes as no surprise that both, the private and public sector[398] have acknowledged, that the implementation of cloud can help to increase productivity and agility, enter new business areas, improve innovation, and allows for more effective mobile working and the application of standard processes to simplify work.[399] While the so far presented points towards a very optimistic future for cloud service, it remains open to further development whether cloud service will to be dominated by low-level hardware machines such as Amazon or Microsoft Azure, or high-level frameworks like Google AppEngine, or whether independent companies like Engine Yard survive in Utility Computing, or whether services such as SAP´s cloud service offering entirely co-opted through business internal cloud providers will be most successful.[400] This view into the crystal ball, however, shall not be further discussed within the framework of this analysis, but remains to be investigated by future research. Rather, within the context of digitalization and business transformation in the EU, it is of relevance to observe if the current EU regulatory framework accurately captures all layers of virtualization of cloud service, since the analysis has proven, that cloud computing in the case of SAP clearly acted as driver for a fundamental DT shift in how the business operates.[401] Several challenges need to be addressed in relation to cloud computing, including, among others, the integration and interoperability of services[402] and market registry for registering and discovering cloud service providers and their services.[403] This shows, that cloud computing in the case of SAP grants the business direct access to commodity IT services, applications and entirely new digital processes, that have resulted in the opportunity to build new capabilities and changed the business' model in a way that generated added value for both, SAP and its customers. Thus, on the one hand the availability of many clouds promotes competition and gives end users more freedom to choose the best service possible. On the other hand, it has become a tedious and time-consuming task for businesses to evaluate and compare the available cloud offerings on the market, which is why an accurate affordance of DT is so crucial to achieve.[404] An overview of the major DT strategies found in the analysis of SAP, based on the five steps of transformation (restructuring, reengineering, revitalization and renewal) introduced by Muyzka et. al. (1995),[405] is provided in **Figure 12** in the appendix.

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[385] Mell P. and Grance T. "*The NIST Definition of Cloud Computing*."

[386] Morningstar Law Group (2018) "The Laws of Cloud Computing: Weathering the Storms of Cyberpiracy, Hacking and IP Infringement."

[387] Ibd.

[388] Metha N. (2012) *"Server Deployment Models – Read the Important Differences,"* accessed May 29, 2020, http://www.cloudtweaks.com/2012/07/the-4-primary-cloud-deployment-models/

[389] Ibd.

[390] Mell P. and Grance T. "*The NIST Definition of Cloud Computing*."

[391] CIO Research Center (2010) "SAAS, PAAS and IAAS – Making Cloud Computing Less Cloudy" accessed June 22, 2020, http://cioresearchcenter.com/2010/12/107/

[392] Hon W. and Millard C. (2013) "Cloud Technologies and Services" in C. Millard (ed) "*Cloud Computing Law,*" Oxford University Press: United Kingdom.

[393] Mell P. and Grance T. "*The NIST Definition of Cloud Computing*."

[394] CIO Research Center (2010) "SAAS, PAAS and IAAS – Making Cloud Computing Less Cloudy."

[395] Boyd N. (2017) "What is the Hybrid Cloud?" accessed 23 July, 2020, https://www.sdxcentral.com/cloud/definitions/what-is-hybrid-cloud/

[396] Hon W. and Millard C. (2013) "Cloud Technologies and Services."

[397] Mell P. and Grance T. (2019) *"*The NIST Definition of Cloud Computing.*"*

### *6.3.4 The European Digital Single Market Ecosystem Dimension*

As highlighted throughout the thesis, the EU has put a new focus on the digital area of its single market. Businesses that want to digitally transform in the age of the Forth Industrial Revolution urgently need revenue opportunities and the willingness of market connection.[406] Some respondents mentioned, that it is challenging to address digitalization for the European digital single market ecosystem in its current form and emphasized, that:

> *"The EU must address digitalization and changes happening with digitalization. The enforcement of new EU legislation such as the GDPR helps to introduce standards that all businesses in the industry must comply with and which in turn helps the EU to increase its*

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[398] Kundra V. (2011) "*Federal cloud computing strategy*," 21 June, 2020, https://marketplace.vion.com/order/uploads/VIONMP5/federal-cloud-computing-strategy.pdf

[399] Schwertner K. (2017) "Digital Transformation of Business."

[400] Armbrust M. et. al. "Above the Clouds: A Berkeley View of Cloud Computing."

[401] Pechardscheck S. "In Cloud we trust?"

[402] Dastjerdi A., Tabatabaei S. and Buyya R. (2010) "An effective architecture for automated appliance management system applying ontology-based cloud discovery." *Proceedings of the 10th IEEE/ACM International Conference on Cluster, Cloud and Grid Computing:* 104-112.

[403] Buyya R., Yeo C. and Venugopal S. (2008) "Market-oriented cloud computing: Vision, hype and reality for delivering it services as computing utilities." *Proceedings of the 10th IEEE International Conference on High Performance Computing and Communication:* 05-13.

[404] Carr N. (2008) "The big switch: Rewiring the world, from Edison to Google." WW Norton & Company. New York: London.

[405] Muzyka D. et. al. (1995) "On Transformation and Building the Entrepreneurial Corporation."

[406] Hossain M. and Heidemann Lassen A. (2017) "How Do Digital Platforms for Ideas, Technologies, and Knowledge Transfer Act as Enablers for Digital Transformation?" *Technology Innovation Management Review* 7**(9)**: 55-60

> *competitive advantage towards other big players like U.S. and China. We must use this as a business benefit in and for Europe."*

In today´s dynamic business environment, the capability to catalyze the emergence and guide the development of the business' external ecosystem offers increasing potential and powerful source for businesses to develop competitive advantage.[407] Dynamic markets and shorter product lifecycles force businesses across different Member States industries to launch new innovations and technologies quicker.[408] Accordingly, the relevance of ecosystem strategies and their execution is underlined and a well-defined and executed innovation ecosystem strategy can help businesses to grow.[409] Business collaboration and interaction with the external environment of the EU digital single market ecosystem depend on multiple different factors (i.e. the logic of specific business action such as DT). However, if the ecosystem follows a different logic than the business internally, the collaboration of the business with the ecosystem becomes a high-level challenge. Therefore, as one interviewee states:

> *"It must be invested in digitalization and infrastructure. Not every state on its own, but together as a united Europe. The Member States need to work more for a united European market, where every country has the same rules for tech companies."*

The quotation states that business must summarize the aspects of knowledge, benefit and innovation which form the basis for the conceptual analysis of the ecosystem.[410] Carayannis and Campbell (2009) evaluated that on the formation of the European knowledge-based economy. Their work highlights, that the conceptual setting of the EU single market has changed in many ways and claim that there is a need to understand the new ways in which it operates. Thus, the authors define the EU as an ecosystem that is characterized by "a multi-level, multi-modal, multi-nodal and multi-agent system of systems". Accordingly, the EU digital single market continuously forms, re-forms and dissolves, which fosters a factual interplay of diverse institutional, political, technological, socio-economic, and business domains when new digital technology is being applied.[411] The political entrepreneur interviewed emphasizes that mentioning as follows:

> *"We should stop to panic about the upcoming changes digitalization is enhancing on our society, and rather, we should embrace the new chances that it offers. European and political decision-makers have a responsibility to establish clear rules, so that the Member States can support the labor markets and digitalization can become a success."*

Following a systemic view of innovation, the search for and acquisition of technological knowledge and innovation should be regarded as process in which a number of stakeholders interact with their external socio-economic environment.[412] In the knowledge-based economy of the EU, businesses are particularly dependent on knowledge resources of other companies and organizations. Thus, the competitiveness of a firm in the dynamic business environment of the EU depends on the competitive quality of its knowledge-based assets and the successful application of assets that allow operational activities to fulfil strategic objectives of DT.[413] The greater need for knowledge, which is driven by the current digitalization, fosters collaboration with partners including business-to-customer (B2C) processes, and the integration of external stakeholders such as government organizations into the process of business value co-creation.[414] Since knowledge and information have become primary wealth-creating assets of companies and are so essential for business innovation management and competitiveness maintenance, here the dimension of the digital single market ecosystem is connected to the earlier introduced customer and process dimension. The success of a business in turbulent markets seems therefore to depend on a company´s ability to further develop, exploit, implement, and maintain a combination of internal and external sources of knowledge and data.[415] In the case of SAP, this was reached by aligning the changing environment of the external ecosystem dimension with internal sources inherent to the earlier described products, customer and process dimensions. It thus appears to be fora foremost task of the Union to offer a digital network, that covers all aspects of digital business transformation in its Member States. However, as one SAP business practitioner states:

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[407] Williamson P.J. and De Meyer A. (2012) "Ecosystem Advantage: How to Successfully Harness the Power of Partners." *California Management Review* 55**(1)**: 24–46.

[408] Pellikka J. and Ali-Vehmas T. (2016) "Managing Innovation Ecosystems to Create and Capture Value in ICT Industries." *Technology Innovation Management Review* 6**(10)**: 17-24.

[409] Rohrbeck R., Hölzle K. and Gemünden H.G. (2009) "Opening up for Competitive Advantage – How Deutsche Telekom Creates an Open Innovation Ecosystem." *R&D Management* 39**(4)**: 420–430.

[410] Valkokari K. (2015) "Business, Innovation, and Knowledge Ecosystems: How They Differ and How to Survive and Thrive within Them." *Technology Innovation Management Review* 5**(8)**: 17–24.

[411] Carayannis E.G. and Campbell D.F.J. (2009) ""Mode 3" and "Quadruple Helix": Toward a 21st Century Fractal Innovation Ecosystem." *International Journal of Technology Management* 46**(3/4)**: 201–234.

[412] Lundvall B.Å. (1992) "*National Systems of Innovation – Toward a Theory of Innovation and Interactive Learning*." London: Pinter Publishers.

> *"Comparing the requirements to comply with EU legislation and with other eco-legal spheres outside the Union is very often frustrating because we are too slow and inflexible. If more flexibility could be gained through a reform, this would be great. But again, when EU rules are applied this brings a certain EU competitive advantage that businesses in turn benefit from long-term. Because using European attitude helps companies to be more accepted also outside of Europe."*

According to this quotation, potential benefits for businesses engaging in inter-organizational collaboration and with the EU ecosystem can be summarized as follows in **Table 2** in the appendix. In the knowledge-intensive economic landscape of the European DM, businesses depend upon actions made by other entrepreneurs and rely on the external support of other organization. This creates a network with linkages that can be considered as the ecosystem of the DM, in which commercial businesses and organizations interact with one another to create and capture economic value.[416] As for the case of SAP it was found that the data availability, provision and traffic increases efficiency, productivity and competitiveness on the one hand:

> *"I think that on the one hand, the DSM and other legislation can help to regulate the specifics of new technologies by providing guidelines and legal certainties. However, on the other hand, legislation can also become quickly outdated because of the rapid changes' digitalization enforces. Additionally, the need to harmonize legislation enforced at EU level with national legislation is a complicating factor. Which can both be seen on the example of the GDPR* - Academic Digitalization Expert.*"*

- and transparency and security issues regarding the DSM ecosystem on the other hand:

> *"European legislators enforced the GDPR to increase harmonization, to update the DSM and to strengthen the powers of Member States' data protection agencies. In this regard, I see a clear issue of liability in the current EU data protection (i.e. in the area of e-commerce). By giving agencies more power, the GDPR aimed to increase harmonization, to update rules, strengthen the enforcement of data protection and help issues that occur in business practice. However, as the guidelines remain rather vague, courts and agencies*

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[413] Teece D.J. (2007) "The Role of Managers, Entrepreneurs and the Literati in Enterprise Performance and Economic Growth." *International Journal of Learning, Innovation and Development* 1(**1**): 43-64.

[414] Hossain M. and Heidemann Lassen A. (2017) "How Do Digital Platforms for Ideas, Technologies, and Knowledge Transfer Act as Enablers for Digital Transformation?"

[415] Pellikka J. (2014) "The Commercialization Process of Innovation in Small High Technology Firms – Theoretical Review." In F. Thérin (Ed.), *Handbook of Research on Techno-Entrepreneurship: How Technology and Entrepreneurship Are Shaping the Development of Industries and Companies* (2nd ed.): Cheltenham, UK: Edward Elgar Publishing Ltd.

[416] Pellikka J. and Ali-Vehmas T. (2016) "Managing Innovation Ecosystems to Create and Capture Value in ICT Industries."

> *are left to interpret breaches with GDPR. Thus, clear applications to Member States practice can be difficult and interpretations of the GDPR differ across the EU and create legal fuzziness* - Academic Digitalization Expert.*"*

Therefore, the case study provides findings in line with previous studies, that have shown that a business´ ability to successfully commercialize new services and products depends on both, its own digital business strategy and capability to develop an innovative ecosystem strategy - referred to earlier as DT strategy.[417] Also observable from the case study is a close connection to the academic community with the aim of soliciting knowledge, innovation, and human resources bundled to the concept of business transformation.[418] However, several questions arise when looking at the ecosystem dimension in relation to SAP´s DT. In order to answer them and to analyze which aspects of the four DT dimensions (*products, customer, processes and the EU digital single market ecosystem*) found for the case of SAP are captured accurately in the legislation of Industry 4.0 and the DSM, the overview of **Table 3** in the appendix provides a summary of major findings from the qualitative literature analysis of the current legislation mapped with business practitioners, legal experts and political entrepreneur perceptions of the matter. The table in the appendix presents a preliminary summary of the so far qualitative literature analysis and suggests, that traditional strategy-related literature does not seem to be enough to capture DT of businesses. Accordingly, the table lists several open questions, that appear after having analyzed the digital transformation attitudes found in the case study of SAP SE. These open questions remain unanswered by the traditional business transformation literature. However, as this chapter will argue, the acknowledgement of the DT dimensions found in the case of SAP provide the necessary practical basis for the entails the current scope of the DSM (and partly the Industry 4.0 framework) lack.[419]

According to the traditional view on business strategy, the external dimension is formed through a focus on competition. The case study, however, provides evidence that instead business internal collaboration and a focus on customers is the main driver that fosters business growth and commercialized innovation. In turn, competitiveness is maintained and enhanced, without being the major focus for SAP.[420] In contrast to the traditional strategy literature, the findings of the case study suggest that the application of the ecosystem dimension is a necessary addition and provision for successful DT of businesses. The four DT dimensions found in the case of SAP suggest, that an individual business performance and capability to capture the value of innovation and new technologies is increasingly dependent on the business' ability to manage assets and resources also outside the direct control (and therefore the perspective of innovation-ecosystem strategy seems to play a crucial role for co-creation, networking, interaction with stakeholders, and conformity with legislation).[421] Moreover, the findings of the case study have proven that increasing collaboration in the EU´s digital single market ecosystem can provide early signals of significant technological and industrial reconfigurations driven by the development of digitalization. In the case of SAP, this was visible, because the application of a cloud service as new technology fostered a business model change.[422] The findings highlight the relevance of a clear communicated and shared business vision, aligned with new developments on the ecosystem dimension.[423] In addition, the decisions related to business resource allocation have to be shared through collaborations in order to meet crucial expectations of all EU digital single market participants. The findings provide evidence, that for a business to become or remain innovative on the market, all four DT dimensions must be aligned and met.[424] As it will be suggested in the next chapter, provided in form of a policy recommendation, the findings of the case study suggest, that executives should consider to start identifying businesses systemically and viewing their DT (and consequently business growth, renewal and competitiveness) as closely intertwined and determined by network dependencies towards the ecosystem of the EU digital single market. However, it is important to note, that among the different roles and types of businesses on the EU´s digital single market, knowledge ecosystems and business ecosystems may conflict as crucial (ecosystem-specific) concerns. On the one hand, strong reactive competition inside the EU makes its market ecosystem oscillate. On the other hand, internal coordination may provide negative feedback processes. Nonetheless, EU legislators may want to increase competition among other parties in order to maintain EU competitiveness and further enhance structures that are mutually beneficial for the ecosystem participants. Within a fully voluntary and collaborative ecosystem where all market participants share the common evolutional views related to all four DT dimension found in the case study of SAP, no strong control mechanisms would be needed. But since the Forth Industrial Revolution is steadily progressing, the EU´s single market has transformed into a digital ecosystem that is constantly being disrupted by new advanced technologies. As the analysis of the application of cloud service in the case of SAP suggests, compliance with the EU legislation currently in place may not be achieved automatically but must be aligned accordingly.[425]

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[417] Bloom P. And Kotler P. (1975) "Strategies for High Market-Share Companies," accessed 23 July, 2020, https://hbr.org/1975/11/strategies-for-high-market-share-companies

[418] Ivancic L. et. al. (2019) "Mastering the Digital Transformation Process."

[419] Wu J. (2012) "Technological Collaboration in Product Innovation: The Role of Market Competition and Sectoral Technological Intensity." *Research Policy,* 41**(2):** 489-496.

[420] Ibd.

[421] Iansiti M. and Levien R. (2004) "Strategy as Ecology."

[422] Schilling M.A. (2008) *Strategic Management of Technological Innovation.* Boston, MA: McGraw-Hill Irwin.

[423] Gawer A. and Cusumano M.A. (2014) "Industry Platforms and Ecosystem Innovation." *Journal of Product Innovation Management* 31**(3):** 417-433.

## 6.2 Discussion and Lessons to learn from the Case of SAP SE

This section will point out remaining legal challenges and barriers (i.e. user privacy, data security in the cloud) detected in the current scope of the DSM and Industry 4.0 framework in affording DT. As the case study and presentation of analysis findings have shown in the last section, there remain security and privacy components when applying new technology and services through DT. In the case of SAP, aligning the internal business model through DT for cloud applications as new service have required higher levels of trust, that have put service and interoperability of data security into question, since these have not accurately been captured by the DSM (as displayed in **Table 3** in the appendix). Thus, this challenge, that businesses may face when digitally transforming, represents a missing link, yet unaddressed by the DSM framework and it will be discussed throughout this section.[426] The wide-ranging legal challenges related to DT concerning cloud computing will then be covered in the next section, together with approaches to deal with them.[427] The fact that more data is constantly linked to individual EU citizens, has triggered debates concerning legislative reforms of data protection requirements currently in place. Especially concerning cloud computing, services and transactions such as the case study of SAP SE has provided with practical illustrative insights, specific requirements relate to data privacy, security, transparency, accessibility, and rights and freedom of data subjects. Such requirements could, for example, restrict personal data from being transferred from one country to another for jurisdictional purposes.[428]

> SAP Business Practitioner: *"I do not believe that it would be beneficial for SAP to offer service and technology in the same way as American or Chinese providers with lesser data*

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[424] Autio E. and Thomas L. (2014) "*Innovation Ecosystems: Implications for Innovation Management?*" In: Dodgson M., Gann D.M. and Phillips N. (Eds.) The Oxford Handbook of Innovation Management. Routledge: London.

[425] Perrons R.K. (2009) "The Open Kimono: How Intel Balances Trust and Power to Maintain Platform Leadership." *Research Policy* 38**(8):** 1300-1312.

[426] Ibd.

[427] Pechardscheck S. (2020) "In Cloud we trust?"

[428] Yoran E. "Data Residency, the Ultimate Step By Step Guide" accessed May 26, 2020, http://www.wellcomedbt.org/data_residency_the_ultimate_step_by_step_guide.pdf

> *protection regulation. Since customers do like the idea of using service offered through providers that are in the EU, they are not bothered by restrictions and downsized that the more specific European data protection framework enforces on our product portfolio. I do believe that Europe needs to go its own way regarding data protection which can be a big opportunity compared to US and Chinse limited data regulations."*

Therefore, it remains difficult for EU legislators to deliver a framework that allows compliance with Member State´s specific requirements for cloud computing, as here IT service is being delivered across multiple countries and thus multinational jurisdictions.[429] Meanwhile, the example of the case study has provided evidence, that cloud providers such as SAP are able to take charge of their contractual terms (i.e. access to data and virtual machines), secure customers' service access anywhere, anytime and from any device, ensure customer data is kept confidential, and use standards to ensure interoperability of services. While the preceding discussion has highlighted, that the procedural nature of EU data protection principle does only little to illuminate how those principles are intended to foster the regimes underlying policy objectives, DSM regulation of the GDPR provides some little assistance to cloud initiatives for which each EU Member State has own relevant service, IT and data processing regulation in place.[430] Why that is the case will be discussed throughout the following sections.

### *6.2.1 Users Privacy in the Cloud*

The concept of privacy is rooted within values of human dignity and autonomy and linked to the protection of personal space. As such privacy is often operationalized as a right to safeguard and control personal information, which makes it a complex concept.[431] Although the delimitation between its interpretation's spheres are subject to controversial discussions and often might in the outcome depend on culture and religion of the specific Member State,[432] the EU has set up a regulatory framework that interprets privacy as a fundamental right.[433] The regulation laid down in directives and laws in the DSM are closely linked with the notion of "informational self-determination," which was developed by the German Federal Constitutional Court.[434] From an economic perspective, the value that the privacy concept holds for individuals can be derived either from individual preferences (privacy as a final good) or from other advantages deriving from keeping information private (privacy as an intermediate good).[435] Meanwhile, economists seem well-equipped to analyze privacy issues of new technologies with a focus on the effects of different information distribution (as information asymmetries) and incentives for disclosing, producing and signaling information, the normative dimension of privacy as a fundamental right of ordinary EU citizens often overlooked. From the economic perspective it is therefore task of European consumer policy to remedy market failures.[436] However, since Member States information economies and behavioral economics also offer a wide range of theoretical insights to why and under which conditions data protection might go wrong,[437] there seems to be a tensions with the protection of privacy as a legal normative concept and economic efficiency in the current scope of the DSM.[438]

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[429] Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data and repealing Directive 95/46/EC (General Data Protection Regulation).

[430] Yeung K. (2017) "Making sense of the European data protection law tradition."

[431] Kerber W. (2016) "Digital markets, data, and privacy: Competition law, consumer law, and data protection."

[432] Ibd.

[433] See Art. 7 and 8 of the Charter for Fundamental Rights, the Directives 95/46/EC ("Data Protection Directive") and 2002/28/EC and the General Data Protection Regulation.

[434] Federal Constitutional Court (Bundesverfassungsgericht), Judgement of 15 December 1983, 1 BvR 209/83 and others – Census, BVerfG 65, 1.

[435] Kerber W. (2016) "Digital markets, data, and privacy: Competition law, consumer law, and data protection."

[436] Posner R.A. (1981) "The Economics of Privacy." *The American Economic Review* 71(2): 405-409.

### *6.2.2 Data Security in the Cloud*

The findings of the case study suggest, that from a business perspective cloud diligence misses to offer necessary clarity through laws and regulation relevant to stakeholders regarding cloud service applications.[439] It was found, that the DSM has difficulties in controlling confidential processing of personal-related data. This is especially the case for hybrid cloud forms as the one found implemented as a new service model by SAP, because this form allows only to be used restrictedly. Thus, the analysis suggests implementing reforms (as shown in **Figure 13** in the appendix), that concern the GDPR regulation of the DSM in three major areas:

First, the GDPR could enforce new portability standards, that concentrate on data transfers, the management of data workloads within the cloud, and making data better accessible to the customers. Service portability also lowers barriers for customers to move to a different provider. In addition to service portability, the GDPR could improve interoperability standards focusing on the migration of data into or out of clouds using the grouping enforced by the US National Institute of Standards and Technology (NIST) into self-service management and functional interfaces. Such reforms to reduce risks of security, business safety and continuity of data would strengthen integration costs coming along with DT for businesses. Second, the DSM could require businesses to implement service content that mentions the location of data centers where cloud computing services are generally provided in a more precise manner through concrete contract provisions.[440] The Industry 4.0 framework in turn could ensure the compliance with this new EU regulation and require its national businesses to guarantee cloud users rights and liabilities in their contracts in a transparent, easily accessible and clear manner. In the same vein, the DSM could enforce a greater compliance to customers' privacy rights in cloud contracts by requiring providers to guarantee confidentiality and integrity of entrusted personal data. As far as legally possible, the Industry 4.0 framework could ensure, that data processing in Germany meets these contractual EU requirements. Although in short term this seems to restrict business DT, because providers must ensure compliance with other regulations – in long-term new contractual provisions could help to increase social responsibility, trust and ultimately a more responsible use by data controllers. To achieve this goal, the DSM could implement additional standard contractual clauses to the current legislation using the ones enacted by the Commission in 2010 as inspirational example. These could act as an important tool for the harmonization of Member States' legislation. Much work is still required for the European Commission to update clauses for EU cloud providers wanting to deal with subcontractors outside the EU. The GDPR with provisions for EU-US subcontracts made a step into the right direction and could be used as a guideline to update the DSM.[441]

> Academic Expert: *"The GDPR offers potentially all the tools needed to regulate cloud providers, but the issue lies with legislation unclarities. As an improvement, a GDPR reform could require cloud providers to increase transparency (i.e. by introducing icons in data information sheets instead of the huge documents with boxes to select and click on)."*

Thus and thirdly, the DSM could provide incentives to encourage EU businesses to provide different service types in the context of cloud service to consider mixed contract types, providing hard- and software temporarily and on-demand service (such as SAP is offering), with predominantly rental-based contractual elements, that correspond to the legally critical nature of cloud computing. Moreover, it has been stressed that clear guarantees in cloud contracts are important. According to the current scope of EU law, cloud provider must guarantee that personal data does not leave the EEA. Therefore, providers from countries with less secure regulations regarding information privacy (i.e. the US) have greater difficulty to provide such guarantees under the GDPR. By way of contract negotiations around individual regulations however, the DSM could ensure that risks are spread across all involved parties. By guaranteeing cloud service providers like SAP possibilities to implement new technology more transparently and efficiently, greater independence would be given to them while new standards ensured fair market environments across the EU digital single market by harmonized DSM regulations.[442] Since the control of data residency is key to improve customer trust in cloud services, awareness and knowledge about the range of countries, that cloud providers operate in, as well as the country specific systems where cloud customers' data resides in should be communicated more clearly. The DSM and the Industry 4.0 framework could accordingly implement new regulations to support DT in the businesses sector that ensures compliance with existing European data protection and security standards. [443]

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[437] Kerber W. (2016) "Digital markets, data, and privacy: Competition law, consumer law, and data protection."

[438] Posner R.A. (1978) "The right of privacy." *Georgia Law Review* 12(**3**): 393-422.

[439] Pechardscheck S. (2020) "In Cloud we trust?"

[440] Ibd.

[441] Ibd.

### *6.2.3 Legal as a Service (LaaS)*

As already elaborated upon, cloud computing, if legally optimized in the DSM framework could become an internationally coordinated and reliable source of productivity gain for the DM.[444] While international regulation is quite clearly a work in progress, there is much the DSM could improve in order to support cloud providers to help customers with their own legal and regulatory obligations. Main reform area targeted by the findings of the case study is the GDPR part of the DSM, which could offer harmonized regulation that helps EU Member States to require providers to improve their business internal auditing processes, certifications, branch-specific codes of conduct, and self-commitments before or during DT. This would improve how cloud providers submit themselves to third party audits (at their own expenses). Additionally, it could help sophisticated businesses to audit other providers to receive reports from them rather than the current general summaries that often lack information.[445] Such audits could in turn prove to be cumbersome for the provider, as they would improve the repetitive nature and disruption to key staff. If the DSM would implement such a new EU standard through a GDPR reform, cloud providers across the EU would eventually come to accept such audits as a "cost of doing business" in the best interest of providers and their customers to work collaboratively. Similar to the Industry 4.0 platform Germany implemented to help the DT of its business sector, the multiple national agencies currently responsible to safeguard European digital standards of the DSM could provide a platform for a diverse consortium of customers from different Member States and industries to guide businesses to perform such a detailed audit of cloud provider compliance, privacy and security controls, to provide the EU with detailed reports.

> Academic Expert: *"I do think that both, the EU and Member States should together encourage and provide platforms that help different businesses and stakeholders to operate and cooperate."*

Before the next section will provide a concrete policy recommendation to reform the DSM in its current form, it is worth noting that most of the already established certifications in scope refer to conventional data centers and services. As with legal audits however, one approach that has been suggested in this section is of voluntary nature using the example of "EuroCloud Certificate", developed by the German EuroCloud Association. For other examples are the

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[442] Pechardscheck S. (2020) "In Cloud we trust?"

[443] Ibd.

[444] Ibd.

[445] Deloitte (2016) "Cloud Computing – What Auditors need to know," accessed 23 July, 2020, https://www.ucop.edu/ethics-compliance-audit-services/_files/webinars/10-14-16-cloud-computing/cloudcomputing.pdf

TÜV Austria Group´s "Trusted Cloud Certification" and the Security, Trust and Assurance Registry from the American-based Cloud Security Alliance to be named. Meanwhile legislators attempt to define a comprehensive "European Gold Standard" for cloud computing, in order to provide EU-wide audit and certification processes for cloud providers.[446] However, such a standard alone is not able to bring the necessary harmonized legislation that tackles challenges and barriers businesses face when digitally transforming. Although more onerous controls and therefore expenses can be avoided for EU businesses through use of self-regulation, it should only be supplementary to the legally binding protection of data privacy that the DSM provides. Self-declarations within cloud contracts also need to contain statements that concern compliance with differing national legislations to provide for common interoperability, data portability, and quality service – all of which is not (yet) captured by the Industry 4.0 framework.[447] Therefore, promotion of self-regulation, codes of conduct, and customer acceptance are necessary compliance proofs, central to improve overall trust in cloud service.[448] What is therefore needed is a seal of quality, that concretely regards SaaS applications based on an audit of the cloud provider, which includes all areas currently found to be inadequately addressed by the DSM – namely, compliance with law and contracts, data security, business operations, processes, and implementation of DT. Thus, the policy recommendation in form of the dimension mapping suggests, that EU legislators should enforce the major reform of DSM that updates existing standards and norms of the GDPR and match them with the requirements found for business DT of cloud service provisions in the case of SAP. In order to provide a clear visualization of these requirements, the DT dimensions found in the case study will be mapped with dimensions detected for the DSM to be reformed. The dimensions are based upon the findings of the qualitative literature and legislation research of the DSM and the Industry 4.0 framework, investigations of SAP´s digital business transformation and the opinions of experts interviewed and will be presented in the form of a policy recommendation in four simplified steps that are expected to be able to close the gaps detected in DT dimensions of the case study, not or not coherently enough scoped in the DSM and Industry 4.0 framework (as illustrated in **Figure 13** in the appendix).

This chapter highlighted that the main issues related to cloud service implementation are data-security, privacy and LaaS. Security, privacy and law-awareness are some of the biggest challenges faced by cloud service providers to implement. Privacy protection policies, currently in place on EU level, consist on a combination of ontologies and rules, that enhance security and privacy in datacenters. The concept of LaaS can be useful to improve the European DSM Strategy with a more semantic cloud policy infrastructure with control, transparency, accountability, and compliance with law in a form of an ethical EU governance. As provided in the case of SAP, LaaS can be incorporated into the cloud infrastructure by coupling legal compliance into Cloud Solution Provider (CSP) services. Cloud providers are still fine-tuning their Service Level Agreements (SLAs) and Terms of Service (ToS), because the concept of cloud computing is still in its infancy. Similarly, EU legislators have not clarified the full blow of cloud computing´s legal impact and so SLAs do not possess necessary teeth to deal with legal issues arising out of clouds.[449] Further legislation needs to be enacted to deal accurately with problems cloud designs foster. Thus, it seems as a broad international legal framework in cyberspace is needed to comply the Member States individual footprints in the Internet world.[450] This kind of framework may best be implemented in cooperation between the EU and the United Nations to lend it international and holistic reach. By coupling legal compliance into CSP services, law-awareness can be incorporated into the cloud infrastructure. The concept of law-awareness (LaaS) as suggested for CSPs is a law-aware semantic cloud policy infrastructure. This infrastructure offers a unique guardian and trusted proxy framework, that provides LaaS for its peers. The super-peer also specifies how law compliant legal cloud policies of the EU are enforced and unify Member State regulation in the super-peer domain. Although this approach seems to work very well for SAP, it needs further exploration. Nonetheless, as it is already working well for several European businesses, the concept of LaaS offers a great addition that may be worth to be added to the current DSM. [451]

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[446] Pechardscheck S. (2020) "In Cloud we trust?"

[447] Ibd.

[448] Ibd.

[449] Krishnan S. and Chen L. (2014) "Legal Concerns and Challenges in Cloud Computing."

[450] Ibd.

### 6.3 Legal Concerns and Regulatory Challenges of Cloud Service

The analysis has addressed regulatory risks inherent to DT, crystalized how cloud based service may provide challenges and risks to businesses that digitally transform.[452] The findings of the qualitative analysis of the current DSM regulation encourage, that a low level of Member States' legislation harmonization is already achieved for data protection.[453] The findings suggest, that the current DSM form is best to be described as "framework law", that tends to set down diffusely formulated and general rules for data protection and processing.[454] Thus, the GDPR in its current form allows for subsequent development of more detailed national rules in Member States as the need arises through DT of businesses across the EU.[455] Accordingly, EU data protection tradition can be understood as regulatory governance regime, which regulates the collection and processing of personal data.[456] If the present DSM is not reformed holistically (as suggested in **Figure 13** in the appendix) and allows for more harmonization of Member States' national legislation, it may lead to unintended consequences. Mainly, as displayed in the previous sections, when reflecting privacy in a pragmatic way, because without disproportionately interfering with technology in the proceeding of the current Forth Industrial Revolution of digitalization it is simply not possible.[457] On the one hand, the observations of the case study of SAP aimed to provide a practical insight to DT. On the other hand, however, cloud service in its current form shows  that much still needs to be regulated in order to reap the full potential of cloud for EU economies (as highlighted by **Table 3**).[458] Thus, the DSM in its current form remains a regulation draft that needs urgent reform.[459] Hon et. al. (2012) argue, that some of the current difficulties of the legal aspects of cloud services not necessarily arise because contract terms are poor, but because the EU data protection laws in scope assume certain things, which are not true in the cloud reality,[460] because cloud computing involves various layers and intermediaries of actors.[461] Therefore, a strict application of data controller-processor dichotomy as necessary under the current EU regulation may be ambiguous.[462] This suggests, that the DSM needs to resolve two main factors: the broad scope of data protection concerning EU citizens, and the high intensity of data protection compliance that the GDPR provides for.[463] As mentioned in chapter 3.3.2, currently the DSM already established both *ex post* and *ex ante* controller´s obligations. But the broad material and scope of EU regulation of the DSM makes data protection an important issue for all EU citizens.[464] Facing the threat of missing effective and deterring data protection sanctions, the DSM would engage meaningful assessments of fairness and necessity such as with specific compliance maps for Member States, accountability tools, trust marks, and certification schemes.[465] In addition, the enforcement of further data protection obligations could remain determined by priorities of Member States and their national data protection authorities.[466]

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[451] Ibd.

[452] Currie W.L., Gozman D.P. and Seddon, J.J. (2017) "Dialectic tensions in the financial markets: A longitudinal study of pre- and post-crisis regulatory technology." *Journal of Information Technology* **33:** 304-325.

[453] Nwankwo I.S. "Missing Links in the Proposed EU Data Protection Regulation and Cloud Computing Scenarios."

[454] Yeung K. (2017) "Making sense of the European data protection law tradition."

[455] Bygrave L.A. (2014) *"Data privacy law."* Oxford: Oxford University Press.

[456] Gellert R. (2015) "Data protection: a risk regulation? Between the risk management of everything and the precautionary alternative." *International Data Privacy Law* **5:** 03-19.

[457] Pyykko E. (2012) "Data Protection at the Cost of Economic Growth?" *ECRI Commentary* **11:** 01-07.

[458] Commission (2019) "European Commission Cloud Strategy. Cloud as an enabler for the European Commission Digital Strategy," accessed 23 July, 2020 https://ec.europa.eu/info/sites/info/files/ec_cloud_strategy.pdf

[459] Nwankwo I.S. "Missing Links in the Proposed EU Data Protection Regulation and Cloud Computing Scenarios."

[460] Hon K.W., Millard C. and Walden I. (2012) "Negotiating Cloud Contracts: Looking at Clouds from both Sides now." *Stanford Technology Law Review* 16**(1):** 79-105.

[461] Alsenoy B. (2012) "Allocating Responsibility Among Controllers, Processor, and 'Everything in Between': The Definition of Actors and Roles in Directive 95/46/EC" *Computer Law and Security Review* 28**(1):** 25-43.

[462] Blume P. (2013) "Controller and Processor: Is There a Risk of Confusion?" *International Data Privacy Law* 3**(2):** 140-145.

[463] Purtova N. (2018) "The law of everything."

While some of the regulation concerning data security and storage in place is already being debated, it is also important to point out other issues related to cloud, that are neither addressed in the DSM strategy nor the Industry 4.0 framework. Then reviewing the use of cloud service intermediaries (i.e. cloud brokers) there appears a missing link regarding the conduit between the customers and the providers, as there is no infrastructure to process the cloud data.[467] Although the definition of "data producer" within the GDPR includes some cloud intermediaries, not all of them have infrastructure for producing or processing data.[468] Rather, intermediaries, who only provide cloud monitoring services, should be excluded from this term.[469] This is neither the case in the DSM nor in the German Industry 4.0 frameworks. Additionally, as Svantesson (2012) rightly observes, the power-balance in cloud computing agreements is typically different to the power-balance that controllers and processers anticipate under the current GDPR. This seems to call for revisions and reformations (such as through the policy recommendations made in **Figure 13**) in view of emerging structures in modern data processing realities.[470] In view of the mentioned, perhaps the preferable way forward would be for the Commission to boldly abolish the notion of "data processors" from its regulation. Rather, data controller rights and obligations could be enforced to regard anyone processing personal information.[471] Much remains to be done to reap full potential of cloud and so there is a need for legislators at national and European level to comprehensively understand its architecture, features and new related digital business models. Viewed from the perspective of the case study findings, the GDPR can be understood as the EU´s attempt to take steps into the right direction to the extent that it places explicit reliance on the role of so-called `data protection impact assessments´. But, for the time being, relying only on the current scope of the DSM, it does not provide sufficient workable, legitimate and effective regulatory techniques to fully secure the protection of personal data. Additionally, the DSM fails to provide Member States with clear and accessible guidance for data controllers, concerning the content and limits of permissible data handling while ensuring and nurturing public trust.[472]

The case study of SAP SE has provided evidence that the focus regarding DT increasingly shifts debates to areas of contract and data protection rights, rather than linking to issues of liability or intellectual property online which are already scoped into the current DSM framework. The findings thus suggest, that problems of DT for new cloud computing models often fail to fulfil compliance requirements of businesses and national authorities for data processing; including not only data protection and information security, but also transparency, influence, controllability for the storage, and transmission of data via networks.[473] The area of cloud computing provides a complex area, that needs clarification through new standards, which fundamentally needs to be enshrined in EU legislation and regulation. Since technical standards like data formats, application program interfaces (API), protocols and other elements often differ between cloud providers, change of regulation seems a difficult task for European decision-makers. As cloud services are somewhat abstract and intangible, it is hard for cloud providers to fully counter all these concerns and indicate more transparency into their ToS.[474] Notwithstanding SAP´s DT is not yet fully finished, the business has ensured its continuity fitting the new digital needs in a way that provides customers with both, data security and accessibility, which the EU data protection regime inherent to the DSM urgently needs to capture as well.[475]

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[464] Puertova N. (2014) "Who Decides on the Future of Data Protection? Role of Law Firms in Shaping European Data Protection Regime." *International Review of Law, Computers & Technology* 28**(2)**: 204-221.

[465] Ibd.

[466] Purtova N. (2018) "The law of everything."

[467] T-System (2018) "White Paper. Cloud Brokerage Multi-Cloud Strategies Made Easy," accessed 23 July, 2020, https://www.t-systems.com/blob/77586/990c6aa26c17bac8af8f503878b47479/DL_WP_Cloud_Brokerage.pdf

[468] Blume P. (2013) "Controller and Processor: Is There a Risk of Confusion?"

[469] Alsenoy B. (2012) "Allocating Responsibility Among Controllers, Processor, and 'Everything in Between´."

[470] Svantesson D. (2012) "Data Protection in Cloud Computing – The Swedish Perspective."

[471] De Hert P. and Papakonstantinou V. (2012) "The Proposed Data Protection Regulation Replacing Directive 95/46/EC."

[472] Yeung K. (2017) "Making sense of the European data protection law tradition."

[473] Hon K.W. et. al. (2012) "Negotiating Cloud Contracts: Looking at Clouds from both Sides now."

# 7 Conclusion

The analysis presented has shown that cloud service is a part of the range of ICTs that get implemented, when businesses digitally transform themselves and have developed into inseparable part of our modernity. World communities and we, the citizens, have accordingly started to accept digital communication and network systems as the new symbol of our industrial and innovation progress. The creation of the European DM can thus be comprehended as a common way of legislators to promote digitalization by enabling businesses and organizational DT. Resulting from the analysis it can be argued however that the DSM is no specific action agenda with well-defined initiatives and thus does not accurately afford all aspects of DT. Rather, defining such an agenda for the present Commission and EU Parliament period should be the next step EU legislators focus on to reform and improve the digitalization of Member States economies.[476] Additionally the analysis revealed that appropriate regulation on national level is equally important to afford DT, making certain reforms related to data security and privacy necessary within the German Industry 4.0 framework on digitalization (as displayed by **Figure 13**).[477] In order to understand the role and potential of European data protection law in securing the accountability of new technologies applied when businesses across Europe digitally transform, the analysis first identified how regulation and directives of the DSM are intended to operate. It was pointed out that issues relating to data security and privacy are not addressed accurately enough, which also translates to national levels such as for instance for the German Industry 4.0 framework.[478] The upcoming DSM reform in 2021 is likely to endorse a reaction to the platform economy that might prove a bad policy approach. In order to close the resolve barriers detected and close the narrative of the `value gap´ regarding interpretations of the GDPR, the Commission needs to reassess the currently rather counter-intuitive approach of the DSM, that according to the analysis of this thesis seem to be disconnected from empirical evidences found for business DT in the case study of SAP (see **Figure 10** in the appendix and the comparison of the findings with unanswered questions and legal challenges as displayed in **Table 3** in the appendix). Findings of the case study (see also interview transcriptions in the appendix) suggest that the European regulatory framework has missed out to tackle certain legislative issues of cloud service models (as illustrated by **Table 3**) that are increasingly implemented to businesses and industries of all kinds and sizes (as highlighted in **Figure 12**). Based on European experts' and entrepreneurial practitioners' opinions, the analysis made the final recommendation, that all Member States should initiate profound reforms (such as suggested by **Figure 13**) related to the priority over copyright data, legislation and on data leakage in order to make cyber security a new priority at European and national level, that hopefully will receive more attention within a reformed DSM.[479] These regulatory gaps (presented in **Table 3**), that relate to the DT dimensions detected in the case study (as illustrated in **Figure 10**), suggest, that the current scope of the DSM needs some reformation.

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[474] Pechardscheck S. (2020) "In Cloud we trust?"

[475] Ibd.

[476] Pelkmans J. (2016) "What strategy for a genuine single market?" *CEPS Special Report* 1*:* 01-30.

[477] Zaharieva K. (2010) "Perplexity of Implementing the EU Strategy for Digital Single Market."

[478] Yeung K. (2017) "Making sense of the European data protection law tradition."

The last chapter has summarized, that the preventive and process-oriented nature of the current DSM scope seems to restrict the way in which personal data collection and proceedings are done and also prevents excessive `data power´ accumulations in hands of only the biggest data controller businesses. What makes it difficult however for both data subjects and data controllers is, that the scope of EU regulation remains too vague, allowing for much fragmentation among Member States' national legislations, leaving both, data subjects and data controllers to their intuition for recognizing substantive data rights, interests, and values, which the EU data protection regime should ultimately protect.[480] As highlighted by **Figure 13** in the appendix, a reform package with policy initiatives could modify the DSM accurately to realize a genuine functioning European DM that is able to afford DT. This ultimately means, that the current scope of regulation may create unavoidable conflicts between differing data protection regulation at national levels of Member States (as displayed by **Table 3**), as outdated perceptions of data protection needs to be replaced with new interpretations.[481] Although the recommendations proposed have been designed for supporting European legislators in shaping a reform of the DSM, it also aims to support entrepreneurs in flexible organizations and may highlight possibilities to further explore the role of digital transformation designs to develop new, modern business strategy.[482]

It has been stressed that differing national legislation of European Member States result from the broad scope of the DM itself and seem to be at consequence of rapid devaluation of regulations. As the analysis revealed, the DSM is a model, that combines national regulation with European solutions. In turn, the DSM increases legislative differences among Member States. Since these developments seem to extend regulatory uncertainties predominantly for intermediate services such as clouds, that are becoming crucial for the completion of the digital single market, an appropriate solution appears to be to strive for full harmonization in those areas, where this is crucial and possible.[483] The in-depth understanding of the EU single market ecosystem is further complicated due to the participation of many diverse ecosystem participants – especially such in the case of the diverging digitalization approaches of EU Member States.[484] Moreover, it has been elaborated, that the stability of the ecosystem causes concerns, as it is destabilized through the disruptive forces and value chains caused by digitalization, new market dynamics, and advanced technologies (following the development of digitalization in form of the Forth Industrial Revolution as displayed in **Figure 1**). In turn, new market dynamics challenge the traditional view of business making across industries and fundamentally transform business strategies, processes, capabilities, products, and services.[485]And although reforms such as suggested by the policy recommendation in **Figure 13** might ironically end up achieving the opposite of a cultural independent EU digital single market, by prompting globalized enforcement via algorithms developed and controlled by major businesses, the only way forward is to face the fact, that digitalization will continue to progress fast and the EU is better off capturing business DT in its regulation as holistically as possible.[486] EU policymakers need to come to an understanding that businesses play a key role in accelerating the EU´s digital transition. If the DSM would thus more explicitly support digital business transformation, the single market could profit from productivity and efficiency gains that may follow from applications of advanced technology.[487] Accordingly, the DSM should be reformed to allow Member States' democratic systems to proactively overcome the shortcomings addressed in relation to DT. The EU must therefore continue to take on responsibility of digital democracy and support its Member States' societies to allow Europe cultivating a strong inspirational vision of the future, that is able to keep up with the developments of digitalization. It is certain that Europe can be steered towards such a new digital era of shared prosperity and growth, if legislation puts focus on the direction the findings of this analysis point towards.[488]

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[479] Lucian P. (2018) "A few considerations regarding the strategy for the digital single market."

[480] Yeung K. (2017) "Making sense of the European data protection law tradition."

[481] Frosio G.F. (2017) "Reforming Intermediary Liability in the Platform Economy."

[482] Balocco R., Callo A., Ghezzi A. and Barbegal-Mirabent J. (2019) "Lean Business Model Change Process in Digital Entrepreneurship." *Business Process Management Journal* 25(**7**)*:* 1-24.

[483] Pachuca-Smulska B. (2020) "The Impact of Regulatory Techniques."

[484] Pellikka J. and Ali-Vehmas T. (2016) "Managing Innovation Ecosystems to Create and Capture Value in ICT Industries."

[485] Easley D. and Kleinberg J. (2010) *Networks, Crowds, and Markets: Reasoning about a Highly Connected World.*

[486] Frosio G.F. (2017) "Reforming Intermediary Liability in the Platform Economy."

It is worth noting that the conclusions of this thesis are drawn from only a small selection of issues presented in the DSM strategy, and therefore are not wholly representative of the strategy. They have however, in combination with the findings of the case study and the expert interviews, provided an interesting insight into the process and motivation behind the Commission's actions and thus verified that the current scope of the DSM strategy does not accurately affords DT of businesses across the EU. Similarly, the analysis has provided evidence with the case study of SAP that the German Industry 4.0 framework needs to follow reforms in the area of data security and privacy that the DSM is missing. Given the fact that the DSM strategy is still being implemented, other interesting areas of research should mend this study´s limitations – related to the limited size of the interview population and industry specificity of the chosen case study. Additionally, the observer bias characterizing qualitative methodologies in this context differs from the ones found in the literature. Scholars suggest that business models should be assessed as complex and dynamic elements, thus, a methodological approach as the system thinking.[489] However, this study took on a less holistic view and customized a unique example of a business transformation model for only one sector advanced in the field of digitalization. Future studies and contributions could advance the proposed framework of a new digital business model and extent the current understanding of business model theory.

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[487] Pachuca-Smulska B. (2020) "The Impact of Regulatory Techniques."

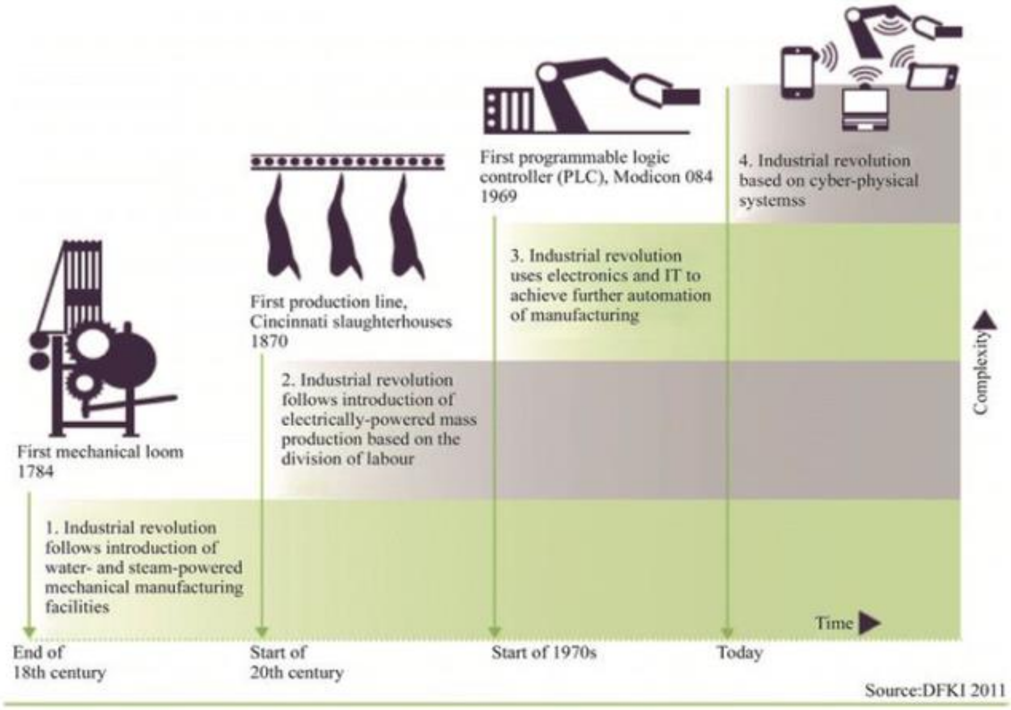
[488] Tsekeris C. (2019) "Surviving and thriving in the Fourth Industrial Revolution."

[489] Sterman J.D. (2001) "System Dynamics Modeling: Tools for Learning in a Complex World." *California Management Review* 43**(4):** 08-25.

# Appendix

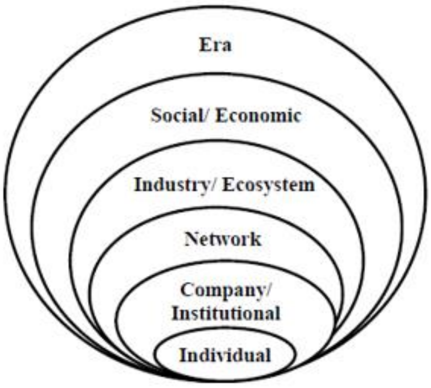
## List of Figures and Tables

### Figure 1: The Four Stages of Industrial Revolution


First mechanical loom
1784
First production line, Cincinnati slaughterhouses
1870
First programmable logic controller (PLC), Modicon 084
1969
1. Industrial revolution follows introduction of water- and steam-powered mechanical manufacturing facilities
2. Industrial revolution follows introduction of electrically-powered mass production based on the division of labour
3. Industrial revolution uses electronics and IT to achieve further automation of manufacturing
4. Industrial revolution based on cyber-physical systemss
Complexity
Time
End of 18th century
Start of 20th century
Start of 1970s
Today
Source:DFKI 2011

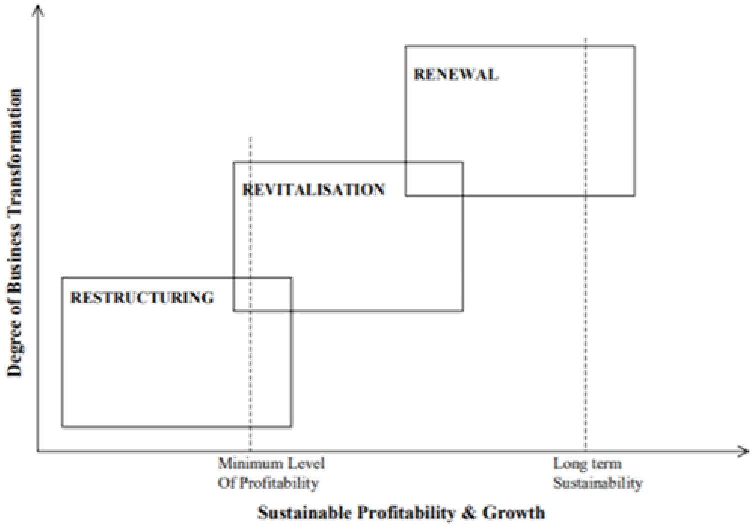
Resource: Kagermann H. (2015) "Change through Digitization – Value Creation in the Age of Industry 4.0." In: Albach H., Meffert H., Pinkwart A. and Reichwald R. (eds) *Management of Permanent Change*. Springer Gabler: Wiesbaden.

### Figure 2: Digital Transformation Perspectives in the Literature


Era
Social/ Economic
Industry/ Ecosystem
Network
Company/ Institutional
Individual

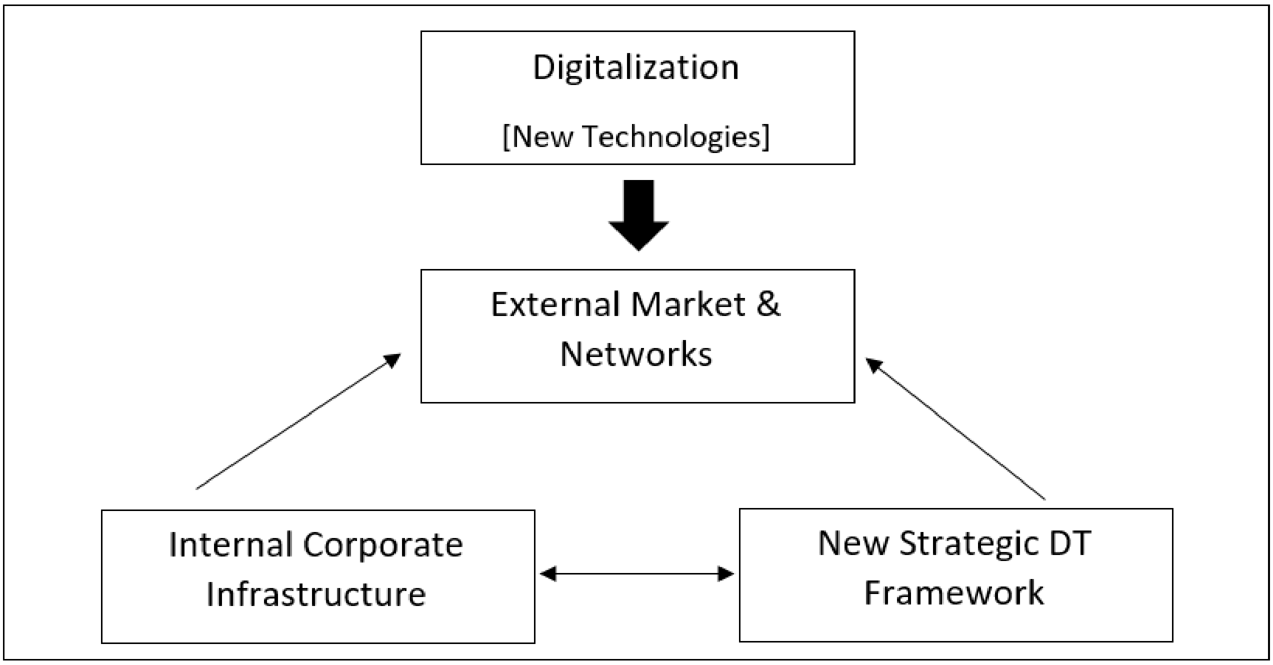
Resource: Ismail M.H., Khater M. and Zaki M. (2017) "Digital Business Transformation and Strategy: What Do We Know So Far?" *Cambrigde Service Alliance*: 01-35.

**Figure 3: Multi-Stage Business Transformation Model**


RENEWAL
REVITALISATION
RESTRUCTURING
Degree of Business Transformation
Minimum Level
Of Profitability
Long term
Sustainability
Sustainable Profitability & Growth

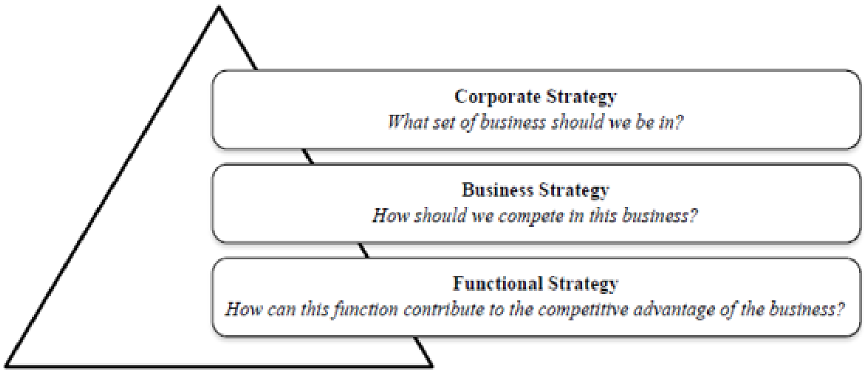
Resource: McKeown I. and Philip G. (2003) "Business transformation, information technology and competitive strategies: Learning to fly." *International Journal of Information Management* 23**(1):** 03-24.

**Figure 4: Conceptual Framework of Digital Transformation Context & Content**


Digitalization
[New Technologies]
External Market & Networks
Internal Corporate Infrastructure
New Strategic DT Framework

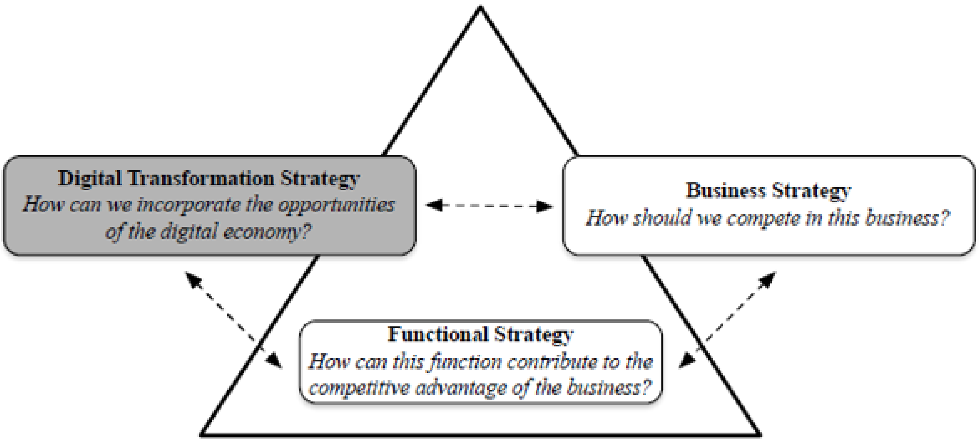
Resource: Own Illustration

## Figure 5: Major Strategy Levels of Digital Transformation


Corporate Strategy
What set of business should we be in?
Business Strategy
How should we compete in this business?
Functional Strategy
How can this function contribute to the competitive advantage of the business?

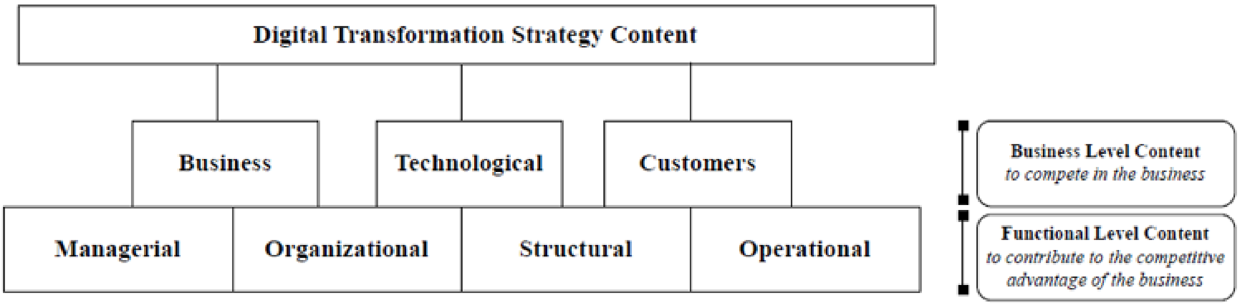
Resource: Mills J., Platts K. and Gregory M. (1995) "A framework for the design of manufacturing strategy processes: A contingency approach." *International Journal of Operations & Production Management* 15(**4**): 17-49.

## Figure 6: Positioning Digital Transformation Strategy


Digital Transformation Strategy
How can we incorporate the opportunities of the digital economy?
Business Strategy
How should we compete in this business?
Functional Strategy
How can this function contribute to the competitive advantage of the business?

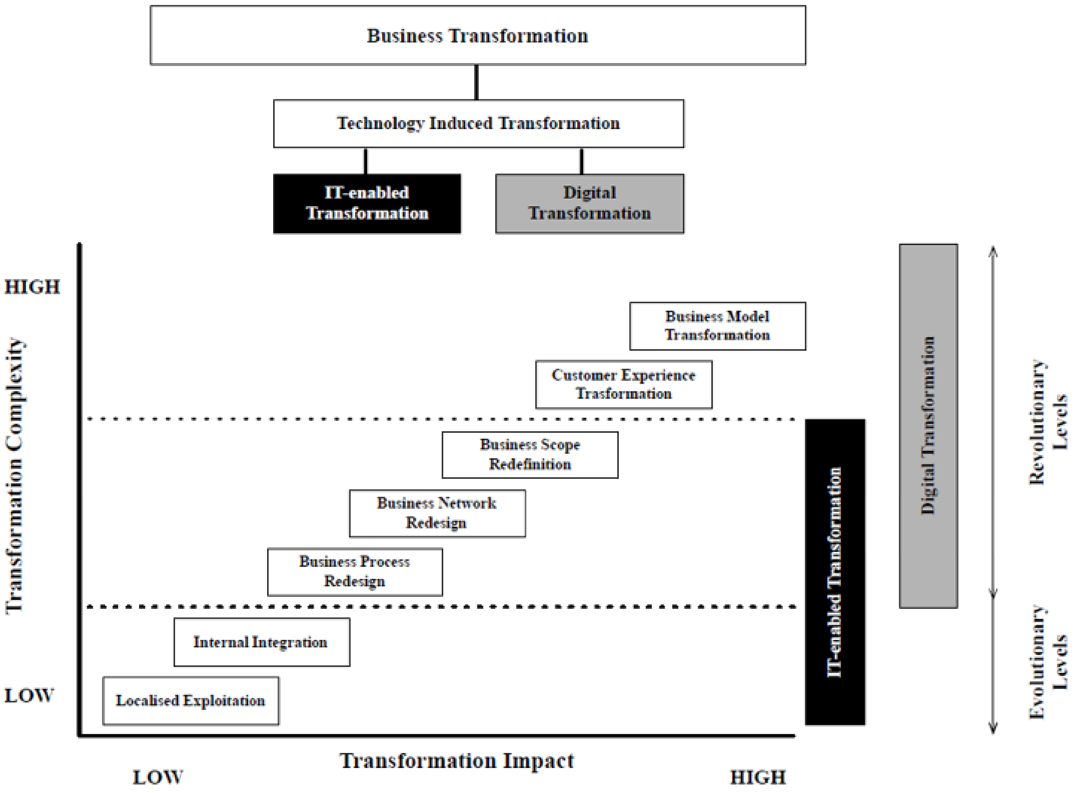
Resource: Sebastian I.M., Ross J., Beath C., Mocker M., Moloney K. and Fonstad N. (2017) "How Big Old Companies Navigate Digital Transformation." *MIS Quarterly Executive* 16(**3**): 197-213.

## Figure 7: Digital Transformation Strategy Content


Digital Transformation Strategy Content
Business
Technological
Customers
Managerial
Organizational
Structural
Operational
Business Level Content
to compete in the business
Functional Level Content
to contribute to the competitive advantage of the business

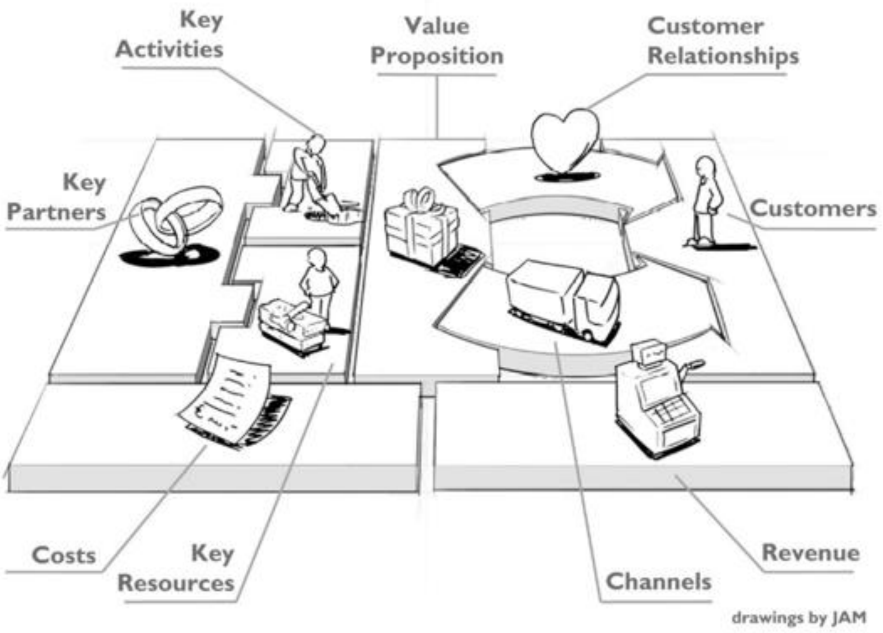
Resource: Ismail M.H., Khater M. and Zaki M. (2017) "Digital Business Transformation and Strategy: What Do We Know So Far?" *Cambrigde Service Alliance*: 01-35.

**Figure 8: Positioning Digital Transformation**


Business Transformation
Technology Induced Transformation
IT-enabled Transformation
Digital Transformation
HIGH
Transformation Complexity
LOW
Business Model Transformation
Customer Experience Trasformation
Business Scope Redefinition
Business Network Redesign
Business Process Redesign
Internal Integration
Localised Exploitation
IT-enabled Transformation
Digital Transformation
Revolutionary Levels
Evolutionary Levels
LOW
Transformation Impact
HIGH

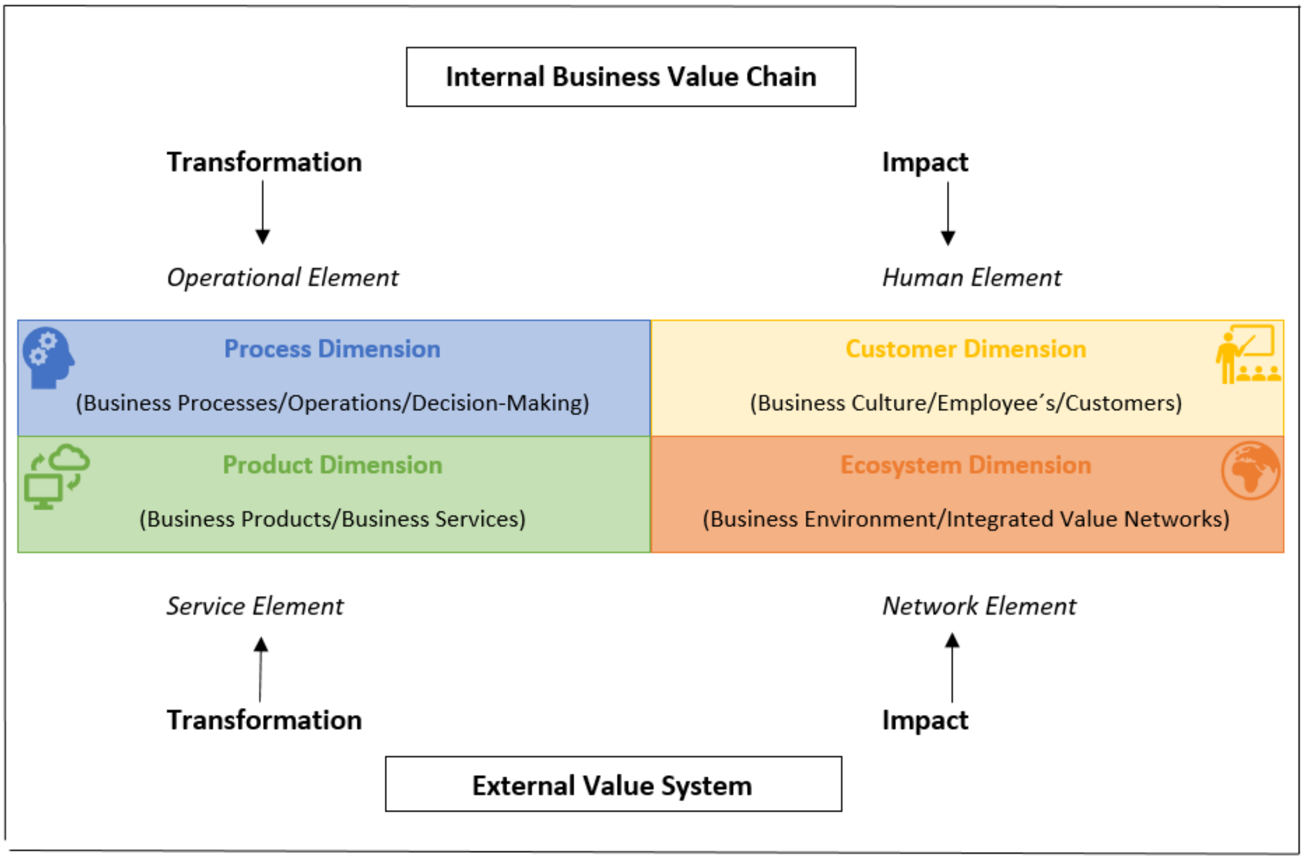
Resource: Venkatraman N. (1994) "It-Enabled Business Transformation - From Automation to Business Scope Redefinition." *Sloan Management Review* 35(**2**): 73-87.

**Figure 9: The Business Model Canvas**


Key Activities
Value Proposition
Customer Relationships
Key Partners
Customers
Costs
Key Resources
Channels
Revenue
drawings by JAM

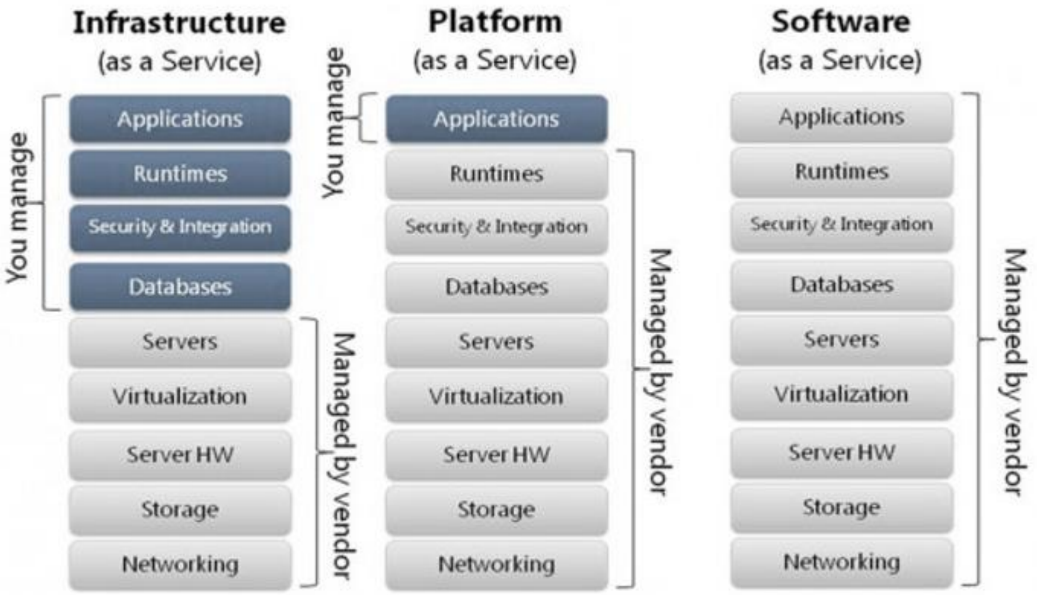
Resource: Osterwalder A. and Pigneur Y. (2010) "Business Model Generation." John Wiley & Sons, Inc., Hoboken: New Jersey.

**Figure 10: Conceptualization of SAP´s Digital Business Model**


Internal Business Value Chain
Transformation
Operational Element
Impact
Human Element
Process Dimension
(Business Processes/Operations/Decision-Making)
Customer Dimension
(Business Culture/Employee´s/Customers)
Product Dimension
(Business Products/Business Services)
Ecosystem Dimension
(Business Environment/Integrated Value Networks)
Service Element
Transformation
Network Element
Impact
External Value System

Resource: Own Illustration

**Figure 11: Cloud Architecture: SAAS, PAAS and IAAS**


Infrastructure
(as a Service)
You manage
Applications
Runtimes
Security & Integration
Databases
Servers
Virtualization
Server HW
Storage
Networking
Managed by vendor
Platform
(as a Service)
You manage
Applications
Runtimes
Security & Integration
Databases
Servers
Virtualization
Server HW
Storage
Networking
Managed by vendor
Software
(as a Service)
Applications
Runtimes
Security & Integration
Databases
Servers
Virtualization
Server HW
Storage
Networking
Managed by vendor

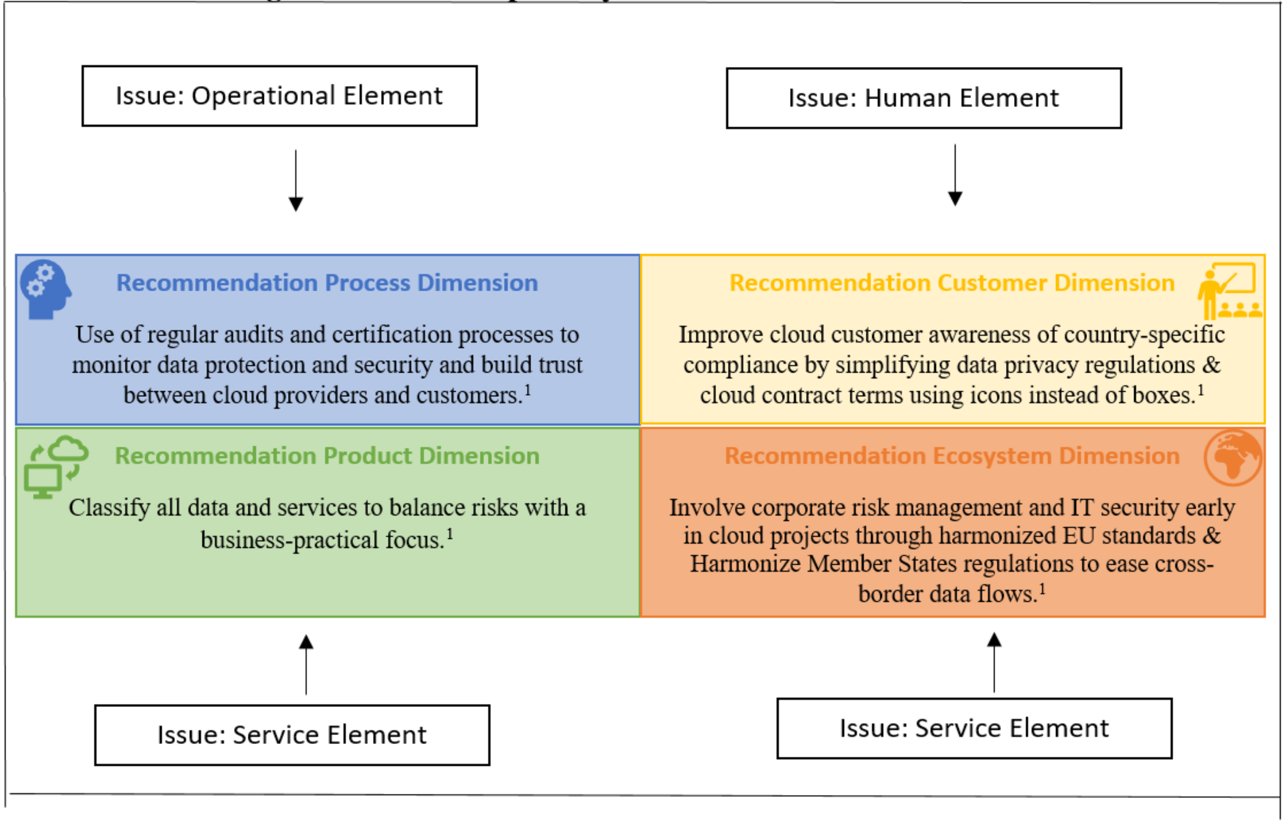
Resource: CIO Research Center (2010) "SAAS, PAAS and IAAS – Making Cloud Computing Less Cloudy" accessed June 22, 2020, http://cioresearchcenter.com/2010/12/107/

**Figure 12: Digital Transformation Strategies Overview**

| **Input** | **Processes** | **Transformation** |
|---|---|---|
| Strategy<br>▪ Product Strategy<br>▪ Transformation Strategy<br>**RESTRUCTURING**<br>▪ Investment<br>▪ Capital Restructuring<br>People<br>▪ Management<br>▪ Workforce | Business Development<br>▪ Structure<br>▪ Competencies<br>▪ Culture<br>**REENGINEERING**<br>▪ Benchmarking<br>▪ Corporate Functions<br>▪ Operations<br>Technology<br>▪ Enabling process redefinition | **REVITALIZATION**<br>▪ Structure<br>▪ Competencies<br>▪ Culture<br>**RENEWAL**<br>▪ Investment<br>▪ Capital Restructuring<br>Delivery<br>▪ Product quality<br>▪ Customer satisfaction |

Resource: Own Illustration

**Figure 13: Four Step Policy Recommendation**


Issue: Operational Element
Issue: Human Element
Recommendation Process Dimension
Recommendation Customer Dimension
Recommendation Product Dimension
Recommendation Ecosystem Dimension
Issue: Service Element
Issue: Service Element

Use of regular audits and certification processes to monitor data protection and security and build trust between cloud providers and customers.[1]

Improve cloud customer awareness of country-specific compliance by simplifying data privacy regulations & cloud contract terms using icons instead of boxes.[1]

Classify all data and services to balance risks with a business-practical focus.[1]

Involve corporate risk management and IT security early in cloud projects through harmonized EU standards & Harmonize Member States regulations to ease cross-border data flows.[1]

Resource: Own Illustration

**Table 2: Major Business Benefits of Inter-Organizational Engagement & Collaboration with the European Union Digital Single Market Ecosystem**

| | |
|---|---|
| **Increased Profitability** | Business collaboration with the EU ecosystem can enable to access necessary resources more quickly and/or obtain important digital skills more rapidly[499] |
| **Shortened Time to Market** | When businesses obtain some required digital capabilities (i.e. for research and development activities) from business partners rather than building them internally flexibility can be enhanced.[500] This might be especially important to technology firms[501] such as in the case of SAP SE. |
| **Enhance Innovation Capability & Learning** | Business collaboration with stakeholders can be an additional important source of development and mutual learning for a company.[502] By transferring and pooling technological know-how and resources[503], SAP SE for example was able to expand its knowledge bases and competences, which resulted in a new product portfolio and greater competitiveness on the EU digital single market. |
| **Expanded Market Access** | Furthermore, businesses may also collaborate to facilitate the creation of new digital business standards.[504] For example, when there is a need for regulation to address a larger base of customers, such as found in the case of SAP SE when cloud service was introduced. In its current transformation stage, collaboration was found as crucial for the company to ensure partnering in the commercialization phase of the application of the intermediate service (i.e. through the standardization of internal business processes as elaborated before in the section about SAP´s process dimension). The findings suggest, that the cooperation between business and the external ecosystem therefore play a highly important role in securing legal compatibility and reducing market uncertainties.[505] |

Resource: Own Illustration

# Table 3: Questions Arising from the DT Dimensions Found in for the Transformation of SAP SE´s Business

| | Traditional Business Strategy Views as found in the Literature | Unanswered Questions detected through the Findings of the DT Dimensions of SAP SE |
|---|---|---|
| **Product Dimension** | **Business Vision & Goals**<br>▪ Is the business vision clear, consistent and understandable?[490]<br>▪ Are all business efforts directed towards a clearly understood and attainable goals?[491]<br>▪ Do these goals accurately measure progress and transformation?[492] | **Business Vision & Goals**<br>▪ Is the business vision based on how services, products and technologies can become integral part of the new digital business structure?[493]<br>▪ Are different roles of digitalization for the business internal DT strategy considered?[494]<br>▪ What are the key business objectives and key performance indicators?[495]<br>▪ How can value creation be captured and measured in relation to the external business dimension?[496] |
| **Process Dimension** | **Business Processes & Organization**<br>▪ What kind of business structure, management systems and business mechanisms are needed to build and maintain key capabilities?[497]<br>▪ What corporate structure is necessary to create value for shareholders and customers?[498] | **Business Processes & Organization**<br>▪ What is the operational scope of internal business collaboration that defines business tasks and activities?[499]<br>▪ How are activities and regular interactions of businesses with the ecosystem[500] dimension of the EU digital single market regulated and governed? |

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| | | |
|---|---|---|
| **Customer Dimension** | **Business Resources & Capabilities**<br>▪ How should business resources be allocated to create an exploitable advantage?[501]<br>▪ What business capabilities are necessary to build, maintain and improve competitiveness?[502] | **Business Resources & Capabilities**<br>▪ What are key stakeholders, businesses, organizations, institutions,[503] agencies, laws and regulation that provide a business with necessary assets (i.e. technology-related funding)?[504]<br>▪ What open transformation approaches can be used to combine internal and external assets[505] into effective business architecture that will generate and ensure competitiveness?[506] |
| **EU Digital Single Market**<br>**Ecosystem Dimension** | **Business Environment**<br>▪ What are the key characteristics of the tech industry, the current business environment (internal and external)?[507]<br>▪ How can the business win, given the competitors in the potential field available?[508] | **Business Environment**<br>▪ What are the impacts of business actions on strategic partners regarding performance in the EU digital single market ecosystem?[509]<br>▪ How does the current business internal value system work and how may it be changed in the future due to/because of DT?[510]<br>▪ What collaboration models exist in the target industry and which one is best aligned with the corporate governance model internal to the business?[511] |

Resource: Own Illustration

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# List of Interview Transcripts

## Interview 1: Questions to determine the Product dimension of Digital Business Transformation

**(SAP Business Practitioner)**

2. Has there recently been a launch of new products that have changed and/or transformed the business model of SAP (e.g. cloud)? Can you please name three examples?
    i. Can you specify the changes made within SAP's business- and operating model impacted by the recently launched products?

- *Personally, I consider the area and work content shift I have experienced in my role as a finance and project manager as part of SAP´s digital transformation process. While previously we offered so called on-prem service to our customers, we have now conversed a new operational business model and offer cloud service.*

    ii. Please name to what extent and what further transformations you are expecting.

- *The shift towards cloud service has been transformational, because rather than the single tended and essential service version the previous on-prem service has provided, SAP can now offer platform solutions, where customers pay on a "as you go" manner. But there are many other areas that transform as well.*

    iii. Since SAP is heavily invested in Europe, do you think the products offered by SAP can contribute to competitive advantages of the European Union towards China or the United States?

- *I do not believe that it would be beneficial for SAP to offer service and technology in the same way as American or Chinese providers with lesser data protection regulation. Since customers do like the idea of using service offered through providers that are in the EU, they are not bothered restrictions and downsized that the more specific European data protection framework enforces on our product portfolio. I do believe that Europe needs to go its own way regarding data protection which can be a big opportunity compared to US and Chinse limited data regulations.*
  *The current development of the Corona Tracing App SAP is working on in collaboration with other businesses and stakeholders shows, that we are still very innovative capable.*

    iv. Do you think SAP's product- and services portfolio produces a competitive advantage towards competitors in the same industry and across the European Union member states?

- *Surely, the Ariba service for instance provides competitive advantages in supply-chains and procurement of systems. Qualtrics is another smart solution that offers opportunities for SAP to collect data in a different way and move its core business to new market ecosystems.*

3. Can you describe challenges and barriers (focused on the following aspects) that SAP faces in relation to its Cloud services offerings?
    a. How do you think these challenges/barriers could be improved by the German legislator?

   b. How do you think the EU could adjust existing frameworks (e.g. data protection, data storage for cloud services) to help businesses to digitally transform?

- *I am not familiar with legislative aspects that may be challenges or barriers to SAPs business making or digital transformation. However, I think that the recently implemented EU law of the GDPR provides a strong regulatory framework that will help businesses across the EU to digitally transform.*

4. SAP as Best Practice? How is SAP strengthening its digital innovation capabilities?
   a. Which three aspects of the following do you consider most important to drive innovation? And why?
      - developing & enhancing digital capabilities of employees
      - collaboration with contractors & consultants
      - cooperation with other organizations/competitors (i.e. partnerships)
      - recruiting employees with knowledge in new digital technologies
      - recruiting leaders (managers) with relevant knowledge in the field of digital transformation
      - mergers & acquisitions to improve internal digital business model

- *We are a real Cloud company (referring to our 73% recurring revenue") and it is important that the entire company lives this Cloud mindset also having in mind that we sell a service and not only licenses (referring to the "pay as you go" model). Therefore, accountability and integrated thinking becomes even more crucial for the employee development and for the success of our service and products. The most important aspect for SAP to drive business innovation is the focus on development and enhancement of employee skills - which includes the recruitment of employees with new digital strategies. Here however, I think SAP still has room to improve and increase collaborations with research institutes and universities. Additionally, there is a need to collaborate with contractors and consultants, which checks back to the product and service portfolio SAP is offering. In certain areas good and strategic collaborations can even help to sell more or new services and products, which explains why SAP´s business focus on this area.*

## Interview 2: Questions to determine the Customer Dimension of Digital Transformation

**(SAP Business Practitioner)**

1. Where and from whom do you think did SAP´s digital transformation initiative originated from (i.e. who participates in SAP´s digital transformation process)?

- *Every one of us is participating in the digital transformation process, bringing empowered people together who have the right mindset and the knowledge for this transformation.*

   a. Which operational changes do you consider at the heart of SAP´s digital transformation?

- *Simplification and adaption of our processes, offering flexible models to the customers, and automation (using our solutions and technologies in order to increasing our level of automation).*

   b. To what extent is customer engagement considered in SAP´s digital transformation strategy? Has the role, how SAP involves and considers customers, changed over time?

- *I would assume that with the time, the customer´s involvement and transformative strategy has changes as followed: customer success is one of our focus and we still improve our strategy regarding customers need. Therefore, we are constantly improving our processes.*

   c. Would you consider greater inclusion of customers, their demands and satisfaction as the highest goal of digital transformation?

- *Generally said, SAP´s solution portfolio needs to be set up in a way that it enables our customers AND SAP to adopt to whatever change comes along. So, SAP needs to understand the needs of our customers therefore SAP has intensified the discussions with our customers to understand their needs even better than in the past.*

5. In which areas have you implemented digital business transformation projects and processes?

- *The whole Procurement from Ariba, Go to Market, operation and process strategies, the SWARM Project, the Best Run Top, in the area of SAP´s Digital Finance and in SAP´s Digital Boardroom (which offers the company financial performance and HR insight to all firm levels).*

   a. What is the main focus of SAP´s business projects and processes?
      1. *customer engagement*
      2. *the implementation of new digital products/services*
      3. *management of the workforce?*

- *Because of the current COVID Situation we must combine all of them and take care of all areas. We shouldn't take focus only into one area and forget the other, so you must find the balance and take action for these projects which are more urgent.*

   b. In which area are you planning to start additional digitalization projects in the next five years to come? Are these projects focused on customer engagement or on the implementation of new technologies/products/services?

- *Crises are changing the business and how we are going forward, therefore it´s not easy to say in which areas we are planning additional digitalization projects. We must adapt our business to the situation. E.g. Supply chain is affected by this, how to adapt intelligent solutions to get more resilience in these crises. We are planning according to the needs of the customers and therefore we are focused on different areas.*

6. What are the roles for other stakeholders (individual & external ones) during digital transformation (i.e. are they involved in defining, designing and implementing digital transformation)?

- *As SAP we need always feedback from customer how we can change processes and make them better. Constantly improving our products, processes and ourselves. Help customer to run their processes better. Additionally, we put a focus on innovation and integration of new technologies and services. However, the most critical topic is the learning attitude of the employees. For example, they need to have a learning mindset and an environment that fosters learning and development this is the most crucial aspect.*

   *a. Do different stakeholders cooperate with each other and do they identify and co-create value for SAP´s digital transformation?*

- *Yes, they do. And actually, this is the best way of exchange where you can bring your ideas together and create values (i.e. agility, efficiency, etc.).*

## Interview 3: Questions to determine the Customer Dimension of Digital Transformation

**(SAP Business Practitioner)**

2. Where and from whom do you think did SAP´s digital transformation initiative originated from (i.e. who participates in SAP´s digital transformation process)?
   - *SAP is a digital company providing support for a digitalization of processes of its customers. It´s digital transformation initiative therefore originates from the delivering of digital services and products to customers.*
     a. Which operational changes do you consider at the heart of SAP´s digital transformation?
   - *For the implementation of digital processes, a certain degree of standardization of processes is needed, as well as process redesign to a certain degree. Standardization is important because it enables to enforce business processes in a digital format without any bypassing (i.e. data tracking, ensure high data quality), which in turn customers also benefit from.*
     b. To what extent is customer engagement considered in SAP´s digital transformation strategy? Has the role, how SAP involves and considers customers, changed over time?
   - *SAP´s business goal is to license or sell the software to its customers. Thus, customers expect that their needs are fulfilled, for which SAP must optimize its processes (i.e. in the case of digitalization finance processes, customers typically want to know what the best practice for them and how other businesses would be do it). Although the focus of process standards has changed over time and* does *not sit at the heart of SAP´s business strategy, it has improved even in non-business critical areas (i.e. HR, finance, strategic areas).*
     c. Would you consider greater inclusion of customers, their demands and satisfaction as the highest goal of digital transformation?
   - *In the past, when SAP´s business focus was mainly on licensing own software in one-time deals, possibilities to react to customers' demands were limited (i.e. stepping back from the deal was not possible under previous software business terms). Contrary to software contracts, customers now with SAP´s Cloud service can cancel contracts and even switch over to a competitor without any major negative impacts. And therefore, the need for SAP to fulfill customer demands is higher in Cloud Service than before.*
7. In which areas have you implemented digital business transformation projects and processes?
     c. What is the main focus of SAP´s business projects and processes?
        1. customer engagement
        2. the implementation of new digital products/services
        3. management of the workforce?
   - *SAP´s business goal is to provide software products that optimize customer´s processes, because revenue can only be increased if we increase the number of customers and offer solutions to existing problems. Therefore, primary focus of everything SAP is developing regards the improvement of existing processes and development of new software to tackle processes that have not been in the scope yet.*

    d. In which area are you planning to start additional digitalization projects in the next five years to come? Are these projects focused on customer engagement or on the implementation of new technologies/products/services?

- *Over time there will of course be new products and services. At the heart of any good business strategy, after applying new technology, products or services, customer engagement should improve over time. When thinking about the dimension of customer engagement as part of SAP´s digital transformation, this is shown by the fact that customers increasingly expect to engage digitally with SAP (i.e. initiative SAP FOR ME where customers can access on individualized webpage about products and services).*

8. What are the roles for other stakeholders (individual & external ones) during digital transformation (i.e. are they involved in defining, designing and implementing digital transformation)?
    a. Do different stakeholders cooperate with each other and do they identify and co-create value for SAP´s digital transformation?

- *Borders between different businesses are blurring, because collaboration networks have developed and increased over time. Thus, products are not anymore produced by one company, but rather develop through exchange of practices and ideas of loosely connected stakeholders and under cooperation and input of several businesses in the industry (i.e. community of developers working together to develop a specific software). One example in Germany is the new COVID 19 App, which SAP is developing. In order to enable other companies in the industry to help, contribute or even build on top of developed software, SAP has released the software code openly. This project shows that there exists a network of different contributors that all aim to make a certain project successful. Sometimes SAP also develops activities for retail customers through collaborations with partners and stakeholders across different industries, which means that cooperation's also take place across countries and continents. Therefore, legal requirements offered by the provisions of the DSM (and partly Germany´s national Industry 4.0 framework) offer standards that provide the basis for collaboration networks of stakeholders, businesses and competitors (i.e. GDPR hinders that SAP hinders from competitors).*

## Interview 4: Questions to determine the Customer Dimension of Digital Transformation

**(SAP Business Practitioner)**

3. Where and from whom do you think did SAP´s digital transformation initiative originated from (i.e. who participates in SAP´s digital transformation process)?

- *Driven from digitalization pressures the financial market outside of the businesses is changing. This effects businesses and stakeholders as much as the motion of selling services and products and the use and demands of technology.*

    a. Which operational changes do you consider at the heart of SAP´s digital transformation?

- *In combination with the described changes on the business external market software is at the heart of SAP´s business making and transformation.*

   b. To what extent is customer engagement considered in SAP´s digital transformation strategy? Has the role, how SAP involves and considers customers, changed over time?

- *Whenever talking about digitalization, customers are considered. However, internally there is always room for improvement and more digitalization can be implemented. For instance, in the sales area business is currently still done rather traditional person-by-person. Externally however, new technologies like Qualtrics can help SAP to improve the marketing of customer experience management by gathering customer experience data contrary to only operational data that traditionally concerns the area of sales. I think, if SAP continuous to combine both of these areas more, it would empower its current digital transformation.*

   c. Would you consider greater inclusion of customers, their demands and satisfaction as the highest goal of digital transformation?

- *I consider two relevant aspects here. On the one side, SAP business highly invests into gaining a holistic view onto customer needs and binding "customers for life". On the other side, SAP´s digital transformation aims to pressures on margins, reduce operational costs, use intelligent tools and increasingly implement new technologies.*

9. In which areas have you implemented digital business transformation projects and processes?
   - *Currently, SAP´s digital transformation projects are all focused on internal businesses making (i.e. in the areas of service, sales and maintenance). One example would be the invoice and payment matching that is currently being digitalized by AI and machine learning. Another example of a digital transformation project is SAP´s digital boardroom that provides design appealing to top management that by combining different sorts of data provides a more holistic business overview.*

   e. What is the main focus of SAP´s business projects and processes?

      1. customer engagement
      2. the implementation of new digital products/services
      3. management of the workforce?

   - *I consider the implementation of new digital products and services at SAP´s digital transformation focus, such as for instance SAP´s development and integration platform HANA that combines different sorts of software's.*

   f. In which area are you planning to start additional digitalization projects in the next five years to come? Are these projects focused on customer engagement or on the implementation of new technologies/products/services?

   - *New technologies, products and services are more considered than customer engagement. This is especially visible in the area of cash and liquidity where much more AI and external data sources will be used to connect to business internal data in order to achieve greater productivity, reduce costs and gain in efficiency.*

10. What are the roles for other stakeholders (individual & external ones) during digital transformation (i.e. are they involved in defining, designing and implementing digital transformation)?

   a. Do different stakeholders cooperate with each other and do they identify and co-create value for SAP´s digital transformation?

- *Customer satisfaction always needs to be considered for digital transformation, no matter if considered for internal or external business dimensions – and this plays a role for any kind of business that plans or already undergoes business transformation.*

## Interview 5: Questions Customer Dimension of Digital Transformation

### (SAP Business Practitioner)

4. Where and from whom do you think did SAP´s digital transformation initiative originated from (i.e. who participates in SAP´s digital transformation process)?
   - *As businesses generate an increasing amount of revenue from digital products, services and experiences, SAP shifted to reflect digital transformation as new priority of running its digital business. This takes place throughout all areas and levels.*
   a. Which operational changes do you consider at the heart of SAP´s digital transformation?
   - *SAP as a software company is per se already very digitized. This also concerns all business internal processes. However, the application of new technologies such as cloud service still provides a powerful driver for digital transformation and it is very possible that this story will repeat itself in the future.*
   b. To what extent is customer engagement considered in SAP´s digital transformation strategy? Has the role, how SAP involves and considers customers, changed over time?
   - *The major driver for SAP´s digital transformation is internally on efficiency gains and the realignment of internal business processes which only then translate into the focus on specific and changed customer demands externally. Reactive measures (i.e. customer demands, competitor pressure) are certainly driving SAP´s current digital transformation more so than proactive measures (i.e. delivering and improve earnings, new technologies disrupting the market).*
   c. Would you consider greater inclusion of customers, their demands and satisfaction as the highest goal of digital transformation?
   - *SAP customer have already experienced digital transformation and some extent the satisfaction of their demands and needs through the specific product portfolio the organization is offering them. Especially in the pre-sales areas it used to normal to provide customers with in-person demos of new products of services, while nowadays all these processes are digitalized. This helped to reduce travel costs and time and create pre-sales more efficient since the same show framework can be reused for different customers.*
11. In which areas have you implemented digital business transformation projects and processes?
   g. What is the main focus of SAP´s business projects and processes?
      1. customer engagement
      2. the implementation of new digital products/services
      3. management of the workforce?
- *Since digitally transforming a business requires a new set of strategies and skills at all business levels SAP has come to emphasize `digital business expertise´ as one of the*

*top capabilities to drive the value of the business organization within the ecosystem of the digital economy.*

   h. In which area are you planning to start additional digitalization projects in the next five years to come? Are these projects focused on customer engagement or on the implementation of new technologies/products/services?

- *Subsequent important to the implementing of new technology and attraction of new digital skills SAP considers the transformation of its corporate culture and creation of a new digital business model as necessary steps to realign its business digitally. Although the decision to implement a new service, product or technology to our businesses is a decision from top down not made by managers, we will certainly consider to find more ways of collaborations with other stakeholders and implement more new projects focused on customer engagement here at our local level.*

12. What are the roles for other stakeholders (individual & external ones) during digital transformation (i.e. are they involved in defining, designing and implementing digital transformation)?

- *95% of SAP´s digital transformation is enforced globally through top-down. Therefore, digital transformation is not something that SAP employees drive. However, it is possible to locally improve certain business areas (i.e. improve workflows, automatization, process standardization), which overall contributes to the transformation developments.*

   a. Do different stakeholders cooperate with each other and do they identify and co-create value for SAP´s digital transformation?

- *SAP has very powerful tools in place that allow the business to align to internal needs, customer demands and the business external market ecosystem. Cooperation's with different stakeholders from in- and outside definitely help to improve business productivity, and efficiency. In turn, viewed from my CFO perspective, this improves local business flexibility linked to national requirements of different SAP locations.*

## Interview 6: Questions to determine the Process Dimension of Digital Business Transformation

### (SAP Business Practitioner)

13. How would you measure the progress in your company in the field of digital transformation?

- *Although SAP´s business is in the IT industry, its digital business model is relatively new. For instance, business supply chain features are still rather manual and not yet digitalized. Thus, the internal rate is rather inefficient and SAP´s operating model still has many areas that can be improved. Here the cloud business is just starting to help satisfying special customer demands and can for instance help to achieve more elasticity.*

   i. What would you define as most relevant success factors to drive SAP´s digital business transformation?

      **=> please select only 3 items and sort them by relevance:**

      - Developing competitive advantage in the market
      - product portfolio (offering new/additional products & services)
      - customer satisfaction (focus on customer demands)

- Go-To-Market (GTM) strategy / effective marketing (increasing efficiency)
- Cost aspects: Managing bottom-line / reducing costs (applying new technology, getting rid of unprofitable products/services)
- Innovation Lifecycle: Investments in innovation (digital technologies and digital skills of workforce)
- Managing supply chain (improving business decision-making)
- Acquiring awareness about customer behavior
- Increasing transparency to gain & keep customer and stakeholder trust

- *I consider customer satisfaction as the most relevant driver for successful digital transformation. Because only if a business can provide its customers the right service at the right time, it will be successful in long-term. Since economies of scale increasingly demand automatization and standardization of processes and services that previously have been offered manual, cost reduction is another very important aspect for the success of digital transformation. Finally, acquiring awareness of customer behavior is from high relevance so that a business can develop a good customer understanding.*

14. How would you describe SAP´s execution on its digital business transformation?
    a. What has changed regarding the structure, competencies and business culture?

- *The execution of SAP´s digital transformation concerns all business levels, ranging from administration over sales to finance departments. Therefore, SAP´s business internal structure competencies and businesses culture is still undergoing changes. For instance, the area of customer engagement is being changed to have a new incentive model that jointly looks at customer demands and needs.*

    b. What has changed regarding benchmarking, corporate functions and business operations?

- *Business internally, the global finance and administration board area transformed and are holding now other units and people accountable for data and benchmarks. However, business externally revenue processes come fist when considering the customer dimension of SAP´s business making.*

15. On which key processes do you see the biggest impact caused by SAPs business transformation?
    - Revenue Processes (Cloud, OnPrem, services)
    - Operational processes (software delivery, cloud delivery, development, services)
    - Corporate Function Processes
    - HR / Talent Management
    - Finance Processes
    - Outsourcing key functions

    or a combination of such or something else not mentioned?

- *It is very important that business processes, revenues and operations are clustered and work together in a streamlined way in order to achieve successful digital transformation. SAP´s corporate functions relating to cloud service is yet only sub-*

*optimal designed, because finance controlling mechanisms need to be in place from a rather early stage on. Here a lot more development in the supply-chain area can be made in the future.*

## Interview 7: Questions to ask Interview Participant from Siemens

**(Siemens Business Practitioner)**

2. In your opinion, how does digitalization change the industry? Do you think there are specific new technologies that change the way of doing business?
   - *Digitalization heavily influences and changes the industry, which helps to increase efficiency and effectiveness in established process and providing opportunities for new business models. I would describe the main changes as: hyper connected (i.e. more connectivity on IoT improves production), smart solutions (i.e. new technologies such as smart cars or intelligent systems) & autonomous (i.e. independent business value chains or autonomous production systems).*
   a. Can you describe challenges and barriers that businesses face when digitally transforming?
   - *A first set of challenges relate to the disruptions digitalization enforces on the "traditional industry" through greater use of IoT and digitalization (processes, systems etc.), for which the EU workforce is not yet adequately digitally trained and educated. This also relates to business internal corporate cultures that are transforming and allow for new digital business models to develop as businesses increasingly consider the changing ecosystem of the EU Digital Single Market. There will thus be an increased demand for specialized digital workforce (educated or trained) that is able to cope with changes implied to these new business models (i.e. change from business-to-business (B2B) towards businesses-to-customer (B2C) business models). One set of issues relate to the greater connectivity achieved by digitalization, as with it more data is deployed and used to create value that needs to be secured, storage and transferred accurately.*
   b. Do you think the European Union should strengthen the digital transformation of Member States business sectors, and why?
   - *EU must address digitalization and changes happening with digitalization. Since the EU is offering an innovation friendly platform for Member State cooperation it was made possible for to develop new solutions. E.g. Siemens to develop its new transport offering (services), where payment of the service contract depending in availability of trains. The solution has helped to improve the bad transport situation in Spain. Additionally, the enforcement of new EU legislation such as the General Data Protection Regulation (GDPR) helps to introduce standards that all businesses in the industry have to comply with and which in turn helps the EU to increase its competitive advantage towards other big players like U.S. and China. We must use this as a business benefit in and for Europe (e.g. export).*
   c. Do you think some businesses are better digitally transformed than others?
      i. Why do you think that is the case and would you consider digital transformation as a competitive advantage towards other companies in the field?

- *Businesses increasingly emphasize that collaboration is important to be able to interact in the diverse national legislations of Member States across the EU, which the DSM helps to simplify through legislation harmonization. Not only big companies like SAP and Siemens profit from EU regulation, but by certain funding and support tools, the DSM also should help esp. small and medium sized (SME´s) businesses to digitally transform. Siemens for example emphasizes this new trend and currently sets up a new collaboration network with stakeholders in Brussels that covers aspects of artificial intelligence (AI).*

3. What role could the Industry 4.0 framework play here and what would you recommend to German legislators to reform?

- *Concerning the development of digitalization, the concept of data ownership is being highly discussed. Here, the scope of the current Industry 4.0 framework needs to catch up with the new reforms of the DSM regarding GDPR in 2 main pillars (other pillars are already addressed inside PI4.0):*
    1. ***The share of data (data security, storage, transfer)***
    2. ***The concept of data as intellectual property***

4. What is in your knowledge the EU doing to help businesses to digitally transform?
    i. Are there any policy issues and regulatory issues in the current EU legislation for the digital single market you can think of?

- *EU legislation can only support businesses to digitally transform on the ecosystem of the Digital Single Market but is not responsible to help businesses to gain competitive advantages. This is responsibility of the businesses and companies. EU should support this with innovation friendly regulations. The targets of the DSM are good, but legally seem to lag certain disruptive changes of new technologies (i.e. AI, Cloud Service).*

    ii. What additional legislation/policies would you recommend enforcing in order to foster the digitalization of the European business sector?

- *From a business-industry-perspective the upcoming new DSM could put more emphasize on providing businesses with an innovation and collaboration friendly Digital Single Market ecosystem.*

    iii. Do you consider the current EU legislation on data security as coherent or do you think it could be improved/reformed?

- *EU legislators could improve the current DSM by improving the current collaboration and exchange network on the example of the great network the German Industry 4.0 platform has set up (i.e. industry 4.0 collaborations between Germany, France, Italy) in order to bring together different stakeholders from academia, government, EU workforce and different businesses) under one umbrella. Here, setting up EU expert roundtables could help.*

5. Are you worried about the future of the EEA (EU) as a viable and attractive location for tech-centric enterprises, particularly with regards to the regulatory frameworks in place at the moment?
    a. What do you think, would have to change, to make the EU an attractive and competitive location for tech companies in the future?

- *In addition to more harmonization of the diverse Member State regulations and legislations, standardization of regulation and processes would improve the ecosystem and help businesses to digitally transform. For the upcoming years, the*

*EU needs to put a special emphasize on SME´s that do not possess the same financial capabilities as bigger corporations such as SAP or Siemens.*

b. What would you say, are the biggest upsides to being oversighted by the European Union´s legislative framework and compliance standards?
    i. Do you sometimes feel frustrated about the competitive disadvantage the tight legal framework can result in, compared to other eco-legal spheres like Asia?

- *Comparing the requirements to comply with EU legislation with other eco-legal spheres outside the Union is very often frustrating because we are too slow and inflexible. If more flexibility could be gained through a reform, this would be great. But again, when EU rules are applied this brings a certain EU competitive advantage that businesses in turn benefit from long-term. Because using European attitude helps companies to be more accepted also outside of Europe.*

### Interview 8: Questions to determine the European Digital Single Market Ecosystem of Digital Business Transformation (Academic)

2. Do you think, the European legislative Body is equipped to react quickly enough to the legal challenges, arising in connection to the radical innovative speed of fields like could computing?

    a) Have you heard of the EU Digital Single Market Strategy (DSM)? What do you know about it and do you see any issues with it?

- *I think that on the one hand, the DSM and other legislation can help to regulate the specifics of new technologies by providing guidelines and legal certainties. However, on the other hand, legislation can also become quickly outdated because of the rapid changes' digitalization enforces. Additionally, the need to harmonize legislation enforced at EU level with national legislation is a complicating factor. Which can both be seen on the example of the GDPR.*

    b) What are the biggest regulatory challenges you consider for the often-criticized General Data Protection Regulation (GDPR)?

- *European legislators enforced the GDPR to increase harmonization, to update the DSM and to strengthen the powers of Member States data protection agencies. In this regard, I see a clear issue of liability in the current EU data protection (i.e. in the area of e-commerce). By giving agencies more power, the GDPR aimed to increase harmonization, to update rules, strengthen the enforcement of data protection and help issues that occur in business practice. However, as the guidelines remain rather vague, courts and agencies are left to interpret breaches with GDPR. Thus, clear applications to Member States practice can be difficult and interpretations of the GDPR differ across the EU and create legal fuzziness.*

    c) How do you think the GDPR could be reformed in order to help businesses to digitally transform?

- *On EU level reforms could help Member States data protection agencies and stakeholders to operate, collaborate and exchange on how to interpret the GDPR. I think a rethinking process needs to put more emphasize on this issue of the GDPR that is inherent to the EU´s law body.*

3. Do you think political decision-makers do enough to ensure compliance with legislation on digitalization?
    a. Can you think of any specific legal issues that have risen due to the changing landscape of computing, especially when service, data and infrastructure is not owned by the user (as in the case of Cloud service)?

    - *One legal issue relates to the digital area and huge data basis that is stored on the internet and subsequently to the right of individuals to delete certain information´s from it. A second issue relates to the content and activities that happen online. Here, I see a responsibility issue that is not yet adequately addressed by the EU regulatory framework. A lot of unclarity regarding who is liable for illegal content – is it the people that upload content, or the providers, the Member States or the EU?*

    b. Do you agree that with the application of Cloud service, users can expect the service providers to be accountable for privacy and data?
        a. Are there any monitoring's and checks about business compliance with user expectations, business policies, national and European regulation you know about?

    - *There is so much data being processed for which no clarity exists on who to make accountable for it. Here, additional technology could help to support law enforcement and ensure that EU values and morals adheres to business practice. The GDPR already provides certain aspects by expecting businesses to put in place legal aspects that ensure new technology is applied in a way that respects data privacy rights. However, I think more policy should employ such thinking and help the process the GDPR has partly enacted.*

4. One claim to online databases and Cloud service is that their area of concern is not yet fully explored or discussed since Cloud boundaries are spread across geographical boundaries and each European Member State has their own regulatory framework on how to deal with Cyber world.
        a. How, in your opinion, can cloud service offer customers appropriate control and transparency over how their data is used?
        b. Do you think this causes complications of industry and business understanding of Cloud and its legal complexities?

    - *The GDPR offers potentially all the tools needed to regulate cloud providers, but the issue lies with legislation unclarities.*

        c. Do you think the current legal control measures do adequately address cloud user´s fears regarding data safety and abuse?

    - *The GDPR could require cloud providers to increase transparency (i.e. by introducing icons in data information sheets instead of the huge documents with boxes to select and click on). Additionally, a lack of funding for data protection agencies currently lessen the scope of the GDPR, here the upcoming DSM could invest more.*

5. Are you worried about the future of the EEA (EUW) as a viable and attractive location for tech-centric enterprises, particularly with regards to the regulatory frameworks in place at the moment?

    a. What do you think, would have to change, to make the EU an attractive and competitive location for tech companies in the future?

- *The very different areas the EU is regulating makes an accurate EEA regulation very difficult. I think the fact that data privacy protection in the EU is considered as a fundamental value that is held very dear should come before every economic or business interest. If EU regulation would become stricter and U.S. tech companies would move out of the EEA area this does not necessarily needs to be bad but could provide a chance for the EU to become stronger.*

    b. Do you know if Member States have certain platforms or cooperation networks on which they cooperate, exchange knowledge or best-practice examples in the area of doing business and digital business transformation?

- *In the Netherlands for example there is the Platform voor de InformatieSamenleving (ECP) platform in which the Dutch government cooperates with science, education, but also businesses on digital issues. It e.g. administers a code of conduct on notice and takedown of illegal content.*

        a. If not, who do you think is responsible to encourage the implementation of such (the businesses themselves, the Member States, or the EU)?

- *I cannot decide whose responsibility it should be, but I do think that both, the EU and Member States should together encourage and provide platforms that help different businesses and stakeholders to operate and cooperate.*

## Interview 9: Questions to determine the European Digital Single Market Ecosystem of Digital Business Transformation

### (Political Entrepreneur)

16. What national strategies or policies come to your mind if you think of German digitalization strategies, initiatives, regulation and law?
    - *The "Strategy Artificial Intelligence" is a huge step for us in Germany. Until 2025 the German government will invest over five billion euros into the Strategy. AI will change our society, our labor market and our entire economical system towards digital transformation. Currently, China and the U.S. are market leaders of AI, but the goal for Germany is to become one of the top locations for it too. Therefore, the government has also initiated the national pact of cyber security. This special project promotes the collaboration between administration, economy and science in questions of cyber security, in which too, Germany must become one of the world leaders.*

    a. Do you think the German Industry 4.0 strategy has helped German businesses to digitally transform (i.e. through funding)?

    - *Thanks to our strategy, many companies have already made huge transformations and the COVID 19 crisis has sped the process of digitalization once again. Many businesses have expanded their digital offer and have digitized* *their work processes. The new fiscal package of the government here provides a total of eight billion euros for the continuing of digitalizing the German economy.*

   b. If not, what do you think could be improved?

- *Of course, we have still a lot of work to do. For example, there is still a huge gap between the rural regions and the cities. Some in Germany still have no internet connection up to this date.*
- *The broadband expansion is a big issue for rural regions. And some companies even move to cities to get better internet connectivity. This all lead to job losses in rural areas and thus it's an aim of the government to establish a comprehensive internet coverage as quick as possible.*

   c. Has the Industry 4.0 strategy been successful in your opinion?

- *It is too early to say. Some big challenges are lay ahead of us. We need ambitious ideas. The digitalization isn´t a technology change, it is a change of our entire society and our way of life.*

      i. Can you name the most important improvement the Industry 4.0 framework has encouraged?

- *One of the most important improvements is the digitalization of medium-sized companies and small businesses. These companies often don´t have enough capacities to manage the digital change. Here the Industry 4.0 framework offers a good support for these companies.*

      ii. How have issues with the strategy been flagged?

- *The strategy highlights that we still have a lot work to do to digitally transform our economy. Especially the small companies lack knowledge to implement the data protection regulation to their digital process and need support with their transformation process.*

      iii. What other political or legal issues do you consider in relation to the Industry 4.0 strategy in its current form?

- *We should stop to panic about the upcoming changes digitalization is enhancing on our society, and rather, we should embrace the new chances that it offers. European and political decision-makers have a responsibility to establish clear rules, so that the Member States can support the labor markets and digitalization can become a success.*

17. Do EU Member States in your opinion differ in their national digitalization approaches?

- *Yes, the EU Member States differ in their progresses. Germany is only in the midfield of national digitalization approaches. Sweden or the Netherlands for example, are way ahead of us in the digitalization of public services and in the comprehensive internet access.*

   a. Considering the status quo of German businesses in terms of digitalization:

      i. Do you think Germany is ahead of other EU Member State? Why?

- *Germany is only in the midfield but one of our advantages is our great technical know-how. We have some of the world best computer scientists and engineers which will be very helpful while transforming our economy into Industry 4.0.*

      ii. Do you think the German business sector makes the EU more competitive towards China and the United States? Why?

- *Germany is the biggest national economy of the EU and the brand "made in Germany" is well recognized internationally. So, I think our economy is a huge factor, which makes the EU competitive towards China and the U.S.*

        iii. What do you think, would have to change, to make the EU an attractive and competitive location for tech companies in the future?

- *We must invest in digitalization and infrastructure. Not every state on its own, but together as a united Europe. The Member States need to work more for a united European market, where every country has the same rules for tech companies.*

18. Do you think political decision-makers do enough to ensure compliance with legislation on digitalization?

- *My social democratic colleagues and I want to ensure compliance with legislation on digitalization. First, everybody has the right to control her or his personal data. We need to secure that the security of your privacy must not fall victim to digitalization. The same applies to labor rights. We need to discuss in our society: How will labor look like tomorrow? How we want it to be?*

    a. Can you think of any specific legal issues that have risen due to the changing landscape of computing, especially when service, data and infrastructure is not owned by the user (as in the case of Cloud service)?

- *We have established that we are vulnerable in the digital world. One example is the data scandal of Facebook and Cambridge Analytica. 87 million user data were unlawful skimmed off. Facebook didn´t inform their users about this problem. The lack of transparency, what happens with one´s data, is a big problem with cloud services and social media.*

    b. Do you agree that with the application of Cloud service, users can expect the service providers to be accountable for privacy and data?

- *Sure. The provider must secure the safety of the data and the privacy of the users. We must create clear rules for applications and data security. This is one of the challenges of digitalization. With the data protection regulation of the EU we made a significant step in the right direction.*

        i. Are there any monitoring's and checks about business compliance with user expectations, business policies, national and European regulation you know about?

- *Yes, the data protection officers, and the data protection authorities of the federal states carry out regular checks on providers and companies.*