Contributions to Digital Transformation and Mobile Application Development

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I. Table of Contents

II. Zusammenfassung und Schlüsselworter

In dieser kumulativen Dissertation werden Forschungsarbeiten zur digitalen Transformation in verschiedenen Geschäftsbereichen vorgestellt und diskutiert. Sie erörtert die Chancen und Herausforderungen, denen sich Unternehmen bei der Einführung von Technologien, z. B. mobilen Anwendungen, gegenüberstehen. Zusätzlich wird die Nutzung neuartiger Geschäftsmodelle aus der Perspektive der Technologieakzeptanz untersucht. Mit einem spezifischen Blick auf technische Lösungen werden in dieser Dissertation Probleme bei der Entwicklung mobiler Anwendungen und deren Prozesse untersucht und Implikationen aufgezeigt. Diese Dissertation bereichert den Wissensstand zur mobilen Applikations-Entwicklung und zum Phänomen des digitalen Wandels auf Unternehmens- und Individualebene. Basierend auf den Limitationen der enthaltenen Artikel wird eine Forschungsagenda abgeleitet, die die Grundlage für weitere Untersuchungen im Bereich der digitalen Transformation sowie der mobilen Anwendungsentwicklung bildet. Wissenschaftler können diese Agenda für ihre zukünftigen Forschungsprojekte nutzen.

Schlüsselwörter: Digitale Transformation, Finanzdienstleistungssektor, Energiesektor, Geschäftsmodelle, Entwicklung mobiler Applikationen

III. Abstract and Keywords

This cumulative dissertation presents and discusses research on digital transformation in several business areas. It discusses the chances and challenges businesses face when introducing technologies, e.g., mobile applications. Also, the usage of new technology-accelerated business models is investigated from a technology acceptance perspective. With a specific look at technical solutions, this dissertation examines challenges in mobile application development and their processes and presents implications. This dissertation enriches the body of knowledge of mobile app development and the phenomenon of digital transformation, both on a business and individual level. Based on the limitations of the contained paper, a research agenda is derived that lays the foundation for further tailored investigations in the field of digital transformation as well as mobile application development. Researchers can use this agenda for their further research projects.

Keywords: Digital Transformation, Financial Services Sector, Energy Sector, Business Models, Mobile Application Development

IV. Management Summary

This cumulative dissertation contains 18 academic articles among four areas of research. Implications on mobile application (“app”) development are presented. Furthermore, this dissertation investigated the phenomenon of digital transformation (DT) in the business areas of energy, financial services, urban mobility, and health.

Implications for Mobile Application Development

Mobile apps receive ongoing attention in academia and practice. Several process models and methodologies with or without a special focus on mobile app development exist. However, their usage and adaptation in practice are questionable. Two paper deal with the characteristics and specificities of these process models (Werth, Guhr, & Breitner, working paper, 2019). They provide a taxonomy of process models for mobile app development. The taxonomy enriches the academic body of knowledge by providing a structured overview of which process models or methodologies exist in literature. Interviews with 28 stakeholders involved in a typical mobile app development process were conducted about the knowledge, potential, and fallbacks of the usage of process models for mobile app development. It became apparent that those process models were not very well-known in practice, and companies mostly followed their self-developed guidelines, roughly oriented on agile working methods. Furthermore, the taxonomy and the results were used to derive a high-order reference model for mobile Business-to-X (B2X, "X" for business, customer, etc.) app development from closing this research-practice knowledge divide. In this strategic reference model, four main layers were identified and visualized. All these layers play a crucial role in B2X mobile app development and should be considered by responsible stakeholders, e.g., project managers, in the development process.

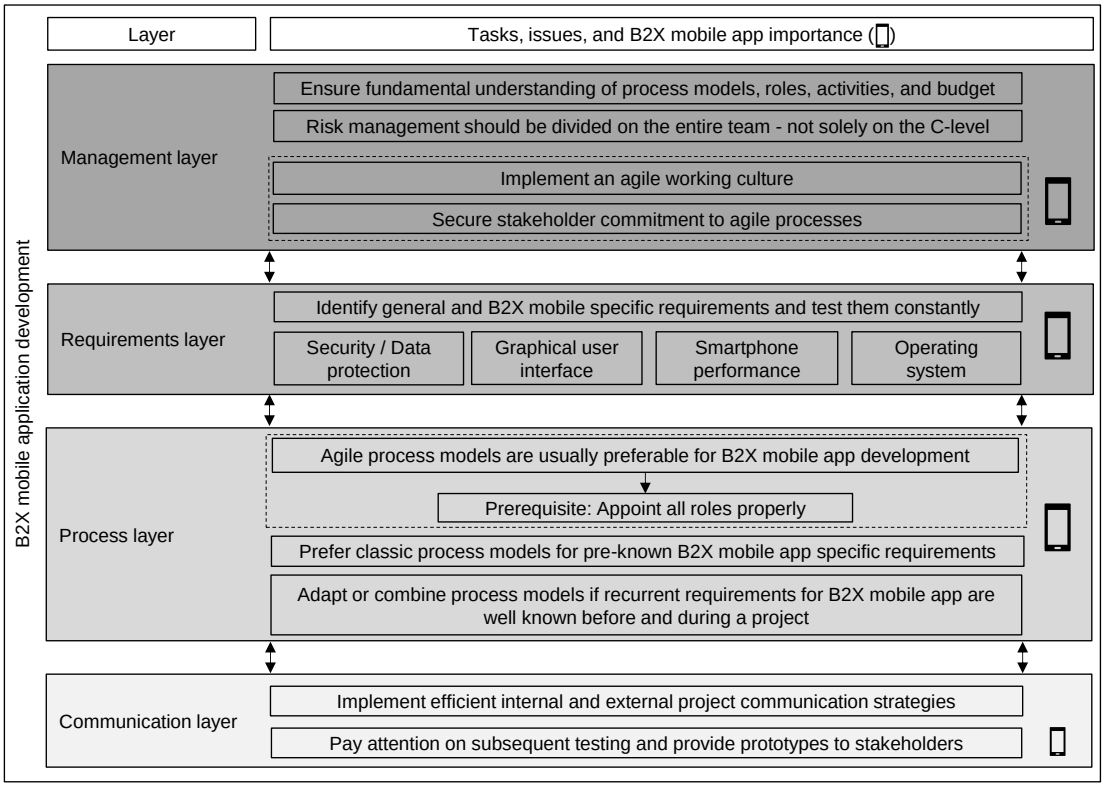

Figure 1. The strategic reference model for holistic B2X mobile application development (REMOB) by Werth et al. (Working paper)

Digital Transformation in the Energy Sector

The energy sector is influenced by digital transformation (DT) and new technologies. Four papers in this dissertation deal with the phenomenon of DT within the energy sector. Energy researchers, social scientists, and practitioners face problems that cannot be solved alone. Therefore, efficient collaboration between those stakeholder groups is important for successful interdisciplinary work within the energy sector. One paper deals with a requirements analysis of crucial elements for such a collaboration platform specially designed for the needs of the energy sector (Werth, Ferenz, & Niesse, 2022b). 36 interviews with experts from the energy sector reveal the first set of requirements that can save the long-term success of a collaboration platform. Requirements can be organized along the five main services: competence, best practices, repository, simulation, and transparency, which should be implemented.

Two paper deal with smart homes (SHs) and their associated chances and challenges (Guhr, Werth, Blacha, & Breitner, 2020; Werth, Guhr, & Breitner, 2020a).

Growing DT enhances new possibilities for private living spaces. The first publication reviewed academic articles about SH in connection with private households. Generally, the literature could be structured among three main categories (SH systems, applications, and end-users). Furthermore, the review identified 15 related concepts of SH in the context of private households that have been investigated. The results were diverse in their context. However, the paper reveals several further research directions toward a better academic understanding of SH in the connection of private households. The second paper is concerned about privacy concerns in the SH context, which was largely unexplored by researchers before (Guhr et al., 2020). A survey-based approach identifies that privacy concerns and other factors, like perceived usefulness and subjective norm, play an important role in the behavioral intention to use SH. From a theoretical perspective, the paper shows relevant predictors for the usage of SH by its intended users. However, their model shows a predictive power of around 53 percent, leaving room for further investigations on this important topic. The results and findings of the paper are depicted in the following:

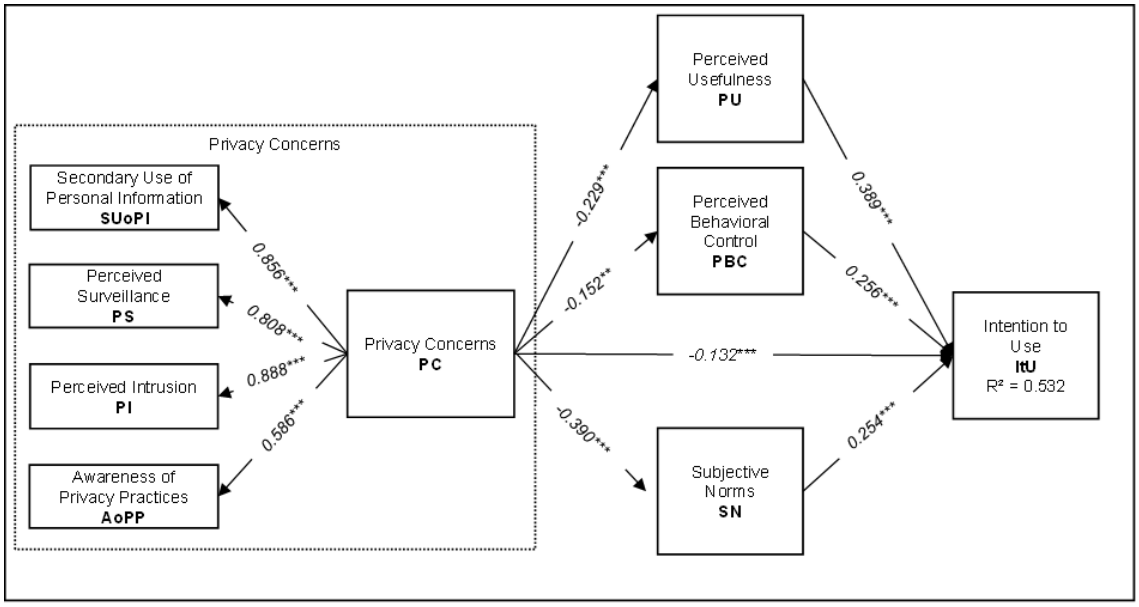

Figure 2. Overview of the results and findings by Guhr et al. (2020, p. 8)

The last research paper comes from Gerlach et al. (2021) and investigates microgrids with morphological analysis. Generally, microgrids integrate energy into

an energy network. Based on their examination, 18 dimensions with 60 characteristics were first identified and structured among the layers of governance, business, intelligence, communication, and physical infrastructure. The authors classified 30 real-world microgrids, and further research directions (FRDs), e.g., social aspects or maturity levels, were identified.

Digital Transformation in the Financial Services Sector

The first of seven papers analyze DT from a general perspective on the financial services sector. With a qualitative approach, the paper of Werth et al. (2020b) investigates the influencing factors of DT in the financial services sector. Their analysis reveals that banks and insurance companies face similar challenges, like the threat of so-called BigTechs (Google, Amazon, Facebook, Apple). However, the influences are perceived differently (banks more than insurance companies).

Three papers focused on (critical) success factors for FinTechs with quantitative and qualitative approaches. The investigation by Roeder et al. (2018) examines 221 FinTech companies and identified that “Product/Service Offering” is the most important factor for success, i.e., venture capital acquisition. The paper of Werth et al. (2019) follows a qualitative approach and interviewed FinTech ventures and venture capitalists for their opinions about relevant critical success factors for FinTech. Nine factors were identified that generally apply to all ventures and FinTechs. Six factors, however, are especially relevant within the FinTech environment, e.g., technology advantage and regulatory knowledge. The recent research paper of Werth et al. (2023, accepted for publication) uses a structured taxonomy-based approach to investigate relevant success factors for FinTechs from past literature among different FinTech archetypes. Their research reveals that factors like “security, privacy, and transparency,” “technology adoption,” “user trust,” and the “cost-benefit dynamic of the innovation” have been identified as crucial for FinTech success. The following figure shows the relative frequencies determined by the taxonomy-based content analysis of success factors for FinTechs by Werth et al. (2023, accepted for publication).

	D1 Strategic factors				D2 Operational factors					D3 Technological factors					D4 Value proposition						D5 User factors						D6 Economic factors		D7 Environmental factors			Cumulative percentage per FinTech archetype
	$C_{1,1}$ Corporate plan	$C_{1,2}$ Operational design	$C_{1,3}$ Competitive plan	$C_{1,4}$ Marketing plan	$C_{2,1}$ Competency-based human resources	$C_{2,2}$ Strategic networks and alliances	$C_{2,3}$ Operational alignment	$C_{2,4}$ Cost-benefit dynamic of the innovation	$C_{2,5}$ Efficiency	$C_{3,1}$ Technology integration	$C_{3,2}$ Technology adoption	$C_{3,3}$ Security, privacy and transparency	$C_{3,4}$ Environmental sustainability	$C_{3,5}$ Ethical issues	$C_{4,1}$ Convenience/usability	$C_{4,2}$ Customization	$C_{4,3}$ Intermediation	$C_{4,4}$ Monetary	$C_{4,5}$ Disintermediation	$C_{4,6}$ Decision support	$C_{5,1}$ User socio-economic characteristics	$C_{5,2}$ User centricity	$C_{5,3}$ User trust	$C_{5,4}$ User-perceived quality	$C_{5,5}$ Cost attractiveness	$C_{5,6}$ Ease of use	$C_{6,1}$ Financial capital	$C_{6,2}$ Cost structure	$C_{7,1}$ Industry rivalry	$C_{7,2}$ Market conditions	$C_{7,3}$ Regulation	
Alternative trading venue	3%	4%	3%	4%	2%	7%	2%	3%	2%	6%	10%	4%	0%	0%	0%	0%	8%	4%	1%	0%	4%	4%	6%	6%	0%	3%	5%	1%	3%	2%	3%	100 %
Co-creator of financial analysis	9%	6%	11%	0%	9%	6%	3%	6%	6%	0%	6%	14%	0%	0%	0%	0%	0%	0%	0%	9%	0%	0%	3%	0%	0%	3%	0%	3%	6%	0%	3%	100 %
Cryptocurrency	0%	4%	4%	1%	0%	7%	3%	7%	4%	9%	8%	10%	1%	1%	0%	0%	1%	3%	5%	0%	2%	0%	5%	1%	2%	2%	0%	7%	2%	4%	8%	100 %
Information aggregator	0%	6%	0%	0%	6%	6%	0%	19%	6%	0%	0%	6%	0%	0%	0%	0%	6%	0%	0%	0%	6%	0%	6%	6%	6%	0%	6%	0%	0%	6%	6%	100 %
Insourcer of sub-processes	2%	8%	7%	1%	3%	4%	1%	5%	4%	6%	8%	9%	1%	0%	8%	0%	0%	0%	0%	0%	3%	2%	4%	5%	4%	3%	1%	6%	4%	3%	3%	100 %
Lending community	0%	3%	1%	4%	1%	3%	1%	1%	1%	15%	16%	1%	0%	0%	1%	0%	12%	1%	0%	0%	9%	5%	4%	4%	0%	3%	7%	0%	4%	1%	0%	100 %
Payment services	4%	2%	7%	0%	1%	5%	0%	2%	1%	10%	8%	7%	0%	0%	2%	2%	3%	0%	0%	0%	5%	3%	11%	2%	3%	7%	0%	2%	4%	3%	4%	100 %
Robo-advisor	0%	4%	4%	7%	4%	0%	0%	0%	7%	4%	4%	11%	0%	0%	0%	0%	0%	0%	0%	4%	4%	7%	7%	11%	0%	7%	0%	4%	11%	0%	4%	100 %

Note: Bold black border= most relevant success factors per FinTech business model archetype; Gray box= most relevant success factors per dimension; no literature was found for the business model archetypes "Financial markets intermediary" and "Information extractor"

Figure 3. Relative frequencies of identified success factors for FinTech archetypes (Werth et al., 2023, accepted for publication)

The paper of Torno et al. (2021) focused on mobile personal finance apps that are available in the common app stores like Apples App Store and Googles Play Store. With a taxonomic approach, they classify 170 mobile personal finance apps into twelve dimensions. While investigating these apps, they combined a technical with a financial services perspective. Furthermore, ten distinct clusters of app configurations were found. The paper of Rodrìguez-Cardona et al. (2019) looks specifically at Chatbot technologies and their adoption within German insurance companies. With a mixed-methods approach, they identified that understanding the technology and its interface and the perceived advantage of the usage is crucial for the success of such technologies. At last, Eden et al. (2022) performed a multiple case study within two financial services that implemented technologies for advisory processes. With the help of the Technology-Organization-Environment framework, the paper identified 13 factors that influence advisory work and the involved stakeholders when technological innovations, like video chats, are implemented.

Digital Transformation in Further Business Areas

This dissertation contains five papers that deal with DT in other business areas than the energy and financial services sector.

Two articles are concerned with the introduction and acceptance of ridepooling services. The studies of Sonneberg et al. (2019) and Werth et al. (2021) used well-known technology acceptance models for their survey-based quantitative approaches. Their results from two independent online surveys with 115 and 224 respondents reveal crucial acceptance factors of (potential) users of such urban mobility services. Here, factors like perceived compatibility or usefulness strongly predict ridepooling services. The results of the bootstrapping analysis by Werth et al. (2021) are presented in the following figure:

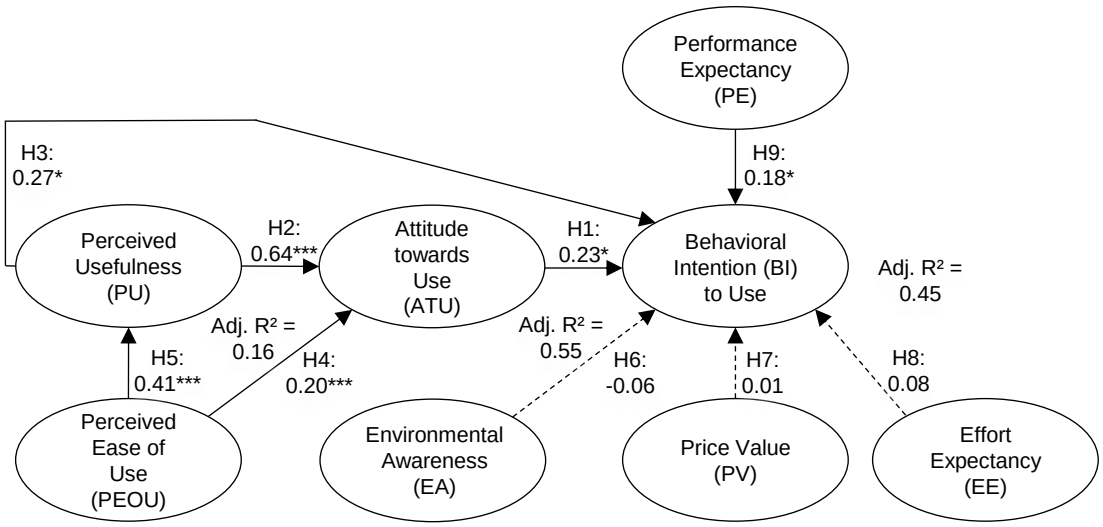

Figure 4. Results and findings of the bootstrapping analysis for the structural model according to Werth et al. (2021, p. 1317)

Another article in the industry sector examines ten design principles for knowledge management services for smart services (Dreyer, Werth, Olivotti, Guhr, & Breitner, 2021). The structured literature review of 157 papers extracted crucial requirements, i.e., design principles, for knowledge management services for smart services that should be considered in such artifacts' implementation and design process.

With a focus on the health sector, Mueller et al. (2022) investigated 55 apps for depression with a taxonomic approach. Depression is a major concern for societies and can be burdened on people. However, several apps for depression exist. This market for apps for depression is fragmented and can be overwhelming for

academics and practitioners. Against this backdrop, they investigated eleven dimensions, 46 characteristics, and six different archetypes within this area of interest. The provided taxonomic structure and archetypes can help intended users locate the most appropriate app for depression.

The completed research by Gerlach et al. (2022) investigated artificial intelligence-based cybersecurity services. Cybersecurity plays an important role for companies and private people to protect themselves from cybercrime threats. While the market is growing for such services and is somewhat fragmented, they classified 229 services provided and clustered them among four distinct archetypical business models. This examination helps to identify what the market for artificial intelligence-based cybersecurity services is offering. Furthermore, they derived DETRAICS, a decision tree that serves as decision support for interested stakeholders in cybersecurity to choose the most appropriate service for their purposes.

The paper contained in this dissertation is presented and discussed. Based on the limitations and methodologies used, a research agenda with thirteen FRD is presented that can serve as an ignition for more tailored research in the field of mobile app development and DT in business areas.

V. List of Figures

VI. List of Tables

VII. List of Abbreviations

Apps	Applications
ATU	Attitudes Towards Usage
BI	Behavioral Intention
B2B	Business-to-Business
B2X	Business-to-X
CB	Covariance-based
CSF	Critical Success Factors
DETRAICS	Decision Tree for AI-Driven Cybersecurity Services
DP	Design Principle
DSR	Design Science Research
DT	Digital Transformation
EA	Environmental Awareness
EE	Effort Expectancy
FRD	Further Research Direction
IoT	Internet of Things
ISR	Information Systems Research
KMS	Knowledge Management System
PC	Perceived Compatibility
PE	Performance Expectancy
PEOU	Perceived Ease of Use
PEST	Political-Environmental-Social-Technological
PLS	Partial Least Squares
PS	Perceived Safety
PU	Perceived Usefulness
PV	Price Value
R&D	Research and Development
RO	Research Objective
RQ	Research Question
SEM	Structural Equation Modeling
SH	Smart Home
REMOB	Strategic Reference Model for B2X Mobile App Development
TAM	Technology Acceptance Model
UTAUT2	Unified Theory of Acceptance and Use of Technology 2
VC	Venture Capitalist

VIII. Overview of Publications and Task Allocation

The following chronological overview covers 18 research publications, forming this cumulative dissertation's basis. Table 1 provides an overview of the publications contained within this dissertation. Besides the title, authors, and outlets, Table 1 assigns the rating of the German academic association for business research, VHB JOURQUAL 3 (shortly “VHB”), to the contained publications (Henning-Thurau, Sattler, Dyckhoff, Franke, & Schreyögg, 2022). Based on this classification of the VHB, the rating assigns relevant scientific outlets grades from “A+” to “D.”

Contained articles contribute to challenges related to digital transformation (DT), the changes in businesses and their behavior, and mobile application (“app”) development. All publications were written in collaboration. The task sharing of each article and a short introduction to the respective topic are described in the following.

The completed research conference paper “Make or Break. Business Model Determinants of FinTech Venture Success” (Röder et al., 2018) deals with critical venture success determinants of FinTech companies. All involved authors developed the idea of the article. Davinia Rodríguez Cardona and I wrote the theoretical background, results, limitations, and future research. Jan Roeder and Matthias Palmer authored the introduction, methodology, discussion, and conclusion sections. Jan Muntermann and Michael H. Breitner were discussants and contributed to the article's final version. Jan Roeder presented at the Multikonferenz Wirtschaftsinformatik 2018 in Lüneburg, Germany.

The research paper “Successful Mobile Application Development: Towards a Taxonomy of Domain-Specific Process Models and Methodologies” (Werth, Guhr, & Breitner, 2019) contains a taxonomy of process models and methodologies for mobile app development. It discusses the characteristics and dimensions of the investigated process models and methods. I wrote the main parts of the manuscript. Nadine Guhr was responsible for the methodology and details of the discussion. Michael H. Breitner was a discussant and contributed to the article's

final version. I presented at the 52nd Hawaii International Conference on System Sciences in Maui, Hawaii, United States.

The third research paper, “Challenges of the Financial Industry - An Analysis of Critical Success Factors for FinTechs” (Werth, Rodríguez Cardona, et al., 2019), deals with a qualitative examination of critical success factors for FinTech venture success. I wrote the main parts of the manuscript. Jan Nowatschin and Matthias Werner collected and analyzed the interview data. Davinia Rodríguez Cardona and Michael H. Breitner were discussants and contributed to the article's final version. I presented at the 25th Americas Conference on Information Systems in Cancun, Mexico.

The research paper “A Mixed Methods Analysis of the Adoption and Diffusion of Chatbot Technology in the German Insurance Sector” (Rodríguez Cardona, Werth, Schönborn, & Breitner, 2019) investigates the adoption and diffusion factors of chatbot technology in the German insurance sector with a mixed-methods design. Davinia Rodríguez Cardona wrote the main parts of the manuscript with Svenja Schönborn. Michael H. Breitner and I were discussants and contributed to the article's final version. Davinia Rodríguez Cardona presented at the 25th Americas Conference on Information Systems in Cancun, Mexico.

The published journal article “Privacy Concerns in the Smart Home Context” (Guhr, Werth, Blacha, & Breitner, 2020) explores how participants are influenced by privacy concerns regarding their usage of smart home (SH) technologies. Nadine Guhr wrote the main parts of the manuscript with Philip Peter Hermann Blacha. I wrote the theoretical foundations and details of the hypothesis generation section. Michael H. Breitner was a discussant and contributed to the article's final version. The article was published in SN Applied Sciences.

“An Empirical Study of Customers’ Behavioral Intention to Use Ridepooling Services–An Extension of the Technology Acceptance Model” (Sonneberg et al., 2019) investigates critical acceptance factors for ridepooling services with the usage of the Technology Acceptance Model. Marc-Oliver Sonneberg wrote the discussion of the manuscript. Max Leyerer was responsible for the research background and introduction. I wrote the methodology, analysis, and discussion. Wiebke Wille and Marvin Jarlik were responsible for data collection and analysis.

Michael H. Breitner was a discussant and contributed to the article's final version. I presented the research paper at the 14th International Conference on Wirtschaftsinformatik in Siegen, Germany.

The journal article “Smart Home in Private Households: Status Quo, Discussion, and New Insights” (Werth, Guhr, & Breitner, 2020a) analyzes the literature about SHs in private households through a literature review. I wrote the main parts of the manuscript. Nadine Guhr was responsible for the methodology and parts of the discussion. Michael H. Breitner was a discussant and contributed to the article's final version. The article was published in the International Journal of Service Science, Management, Engineering, and Technology.

“Influencing Factors for the Digital Transformation in the Financial Services Sector” (Werth, Schwarzbach, Rodríguez Cardona, Breitner, & Graf von der Schulenburg, 2020b) carves out aspects of DT at banks and insurance companies through qualitative expert interviews. I wrote the main parts of the manuscript with Christoph Schwarzbach. The first two authors were responsible for data collection. Davinia Rodríguez Cardona was accountable for aspects of the discussion. Michael H. Breitner and Johann-Matthias Graf von der Schulenburg were discussants and contributed to the article's final version. The article was published in the German Journal of Risk and Insurance.

The completed research conference paper “Classification of Real-World Microgrids Based on a Morpho-logical Analysis” (Gerlach et al., 2021) classifies 30 real-world microgrids with diverse types and locations and presents them through a morphological box. Jana Gerlach and Sarah Eckhoff wrote the main parts of the paper and collected the data. I wrote the methodology section. All authors contributed to the discussion of the paper. Michael H. Breitner was a discussant and contributed to the article's final version. Jana Gerlach presented at the 27th Americas Conference on Information Systems (online conference).

“Examining Customers’ Critical Acceptance Factors towards Ridepooling Services” (Werth, Sonneberg, Leyerer, & Breitner, 2021) investigates critical acceptance factors for ridepooling services with the Unified Theory of Acceptance and Use of Technology 2 as the underlying theory. I wrote the main parts of the research paper. Max Leyerer was responsible for the research background and

introduction. Marc-Oliver Sonneberg wrote parts of the analysis and discussion. Michael H. Breitner was a discussant and contributed to the article's final version. The journal paper appeared in Transportation Research Record: Journal of the Transportation Research Board.

The completed research paper “More than Mobile Banking – A Taxonomy-Based Analysis of Mobile Personal Finance Applications” (Torno, Werth, Nickerson, Breitner, & Muntermann, 2021) examines common characteristics and dimensions as well as archetypes of mobile personal finance applications through a taxonomic approach. Albert Torno and I contributed to the manuscript equally. Robert C. Nickerson, Michael H. Breitner, and Jan Muntermann were discussants and contributed to the final version of the article. Albert Torno presented at the 25th Pacific Asia Conference on Information Systems (online conference).

The journal article “Design Principles for Knowledge Management Systems of Smart Services” (Dreyer, Werth, Olivotti, Guhr, & Breitner, 2021) examines ten design principles through a comprehensive literature review under the Design Science Research paradigm. Sonja Dreyer and Daniel Olivotti wrote the main parts of the paper. I was responsible for parts of the discussion and methodology. Nadine Guhr and Michael H. Breitner were discussants and contributed to the article's final version. The journal article appeared in the e-Service Journal.

The conference paper “Requirements for an Open Digital Platform for Interdisciplinary Energy Research and Practice” (Werth, Ferenz, & Niesse, 2022b) examines critical factors that are relevant to the development of an open digital platform for energy research. I wrote the main parts of the manuscript. Stephan Ferenz contributed to the theoretical backgrounds and discussions. Astrid Niesse was a discussant and contributed to the final version of the article. I presented at the 17th International Conference on Wirtschaftsinformatik (online conference).

“Influences of Digital Innovations on Advisory Work in the Financial Services Sector” (Eden et al., 2022) examines influencing factors for advisory work within two financial services providers. Theresa Eden wrote the main parts of the paper. Christoph Schwarzbach, Davinia Rodríguez Cardona, and I were responsible for data collection and discussions. Michael H. Breitner and Johann-Matthias Graf von der Schulenburg were discussants and contributed to the final version of the

article. The journal article was published in Die Unternehmung – Swiss Journal of Business Research and Practice.

“How is Your Mood Today? - A Taxonomy-based Analysis of Apps for Depression” (Müller, Werth, König, & Breitner, 2022) examines common characteristics, dimensions archetypes of apps for depression through a taxonomic approach. Nina Müller was responsible for data collection and analysis. I contributed to the methodology and theoretical backgrounds. Claudia M. König and Michael H. Breitner were discussants and contributed to the final version of the article. I presented this completed research at the 28th Americas Conference on Information Systems in Minneapolis, Minnesota, United States.

The completed research “Artificial Intelligence for Cybersecurity: Towards Taxonomy-based Archetypes and Decision Support” (Gerlach, Werth, & Breitner, 2022) examines common characteristics and dimensions, archetypes, and a decision tree of artificial intelligence-driven business models for cybersecurity. Jana Gerlach wrote the main parts of the paper and collected the data. I was responsible for the methodology section, discussions, and introductions. Michael H. Breitner was a discussant and contributed to the final version of the article. The article was accepted for publication at the 43rd International Conference on Information Systems. Jana Gerlach presented at the conference.

The journal article “What Determines FinTech Success? A Taxonomy-Based Analysis of FinTech Success Factors” (Werth, Rodríguez-Cardona, Torno, Breitner, & Muntermann, 2023, accepted for publication) examines critical factors for the survival of FinTechs with a qualitative-based taxonomy approach. Davinia Rodríguez Cardona and I wrote the main parts of the manuscript. Albert Torno was responsible for theoretical backgrounds, data collection, and discussions. Michael H. Breitner and Jan Muntermann were discussants and contributed to the final version of the article. It was accepted for publication at Electronic Markets.

The working paper “Holistic B2X Mobile Application Development – A Strategic Reference Model” (Werth, Guhr, & Breitner, working paper) examines qualitative expert interviews with mobile application developers. It discusses the character-

istics, chances, and challenges associated with using process models and methodologies for app development. I wrote the main parts of the manuscript. Nadine Guhr was responsible for the methods and parts of the discussion. Michael H. Breitner was a discussant and contributed to the final version of the article. The article is currently a working paper and the outlet has not been determined yet.

#	Date	Title	Order of Authors	Outlet	Status	VHB Jourqual V3	Appendix
1	03/18	Make or Break. Business Model Determinants of FinTech Venture Success	Jan Roeder, Davinia Rodríguez Cardona, Matthias Palmer, **Oliver Werth**, Jan Muntermann, Michael H Breitner	Proceedings of the Multikonferenz Wirtschaftsinformatik, Lüneburg, Germany	Published	D	A1
2	01/19	Successful Mobile Application Development: Towards a Taxonomy of Domain-Specific Process Models and Methodologies	**Oliver Werth**, Nadine Guhr, Michael H Breitner	Proceedings of the 52nd Hawaii International Conference on System Sciences, Maui, Hawaii, United States	Published	C	A2
3	06/19	Challenges of the Financial Industry - An Analysis of Critical Success Factors for FinTechs	**Oliver Werth**, Davinia Rodríguez Cardona, Jan Nowatschin, Matthias Werner, Nadine Guhr, Michael H Breitner	Proceedings of the 25th Americas Conference on Information Systems, Cancun, Mexico	Published	D	A3
4	06/19	A Mixed Methods Analysis of the Adoption and Diffusion of Chatbot Technology in the German Insurance Sector	Davinia Rodríguez Cardona, **Oliver Werth**, Svenja Schönborn, Michael H Breitner	Proceedings of the 25th Americas Conference on Information Systems, Cancun, Mexico	Published	D	A4
5	02/20	Privacy Concerns in the Smart Home Context	Nadine Guhr, **Oliver Werth**, Philip Peter Hermann Blacha, Michael H Breitner	SN Applied Sciences, Issue 2, Article 247	Published	-	A5
6	03/20	An Empirical Study of Customers' Behavioral Intention to Use Ridepooling Services–An Extension of the Technology Acceptance Model	Marc-Oliver Sonneberg, **Oliver Werth**, Max Leyerer, Wiebke Wille, Marvin Jarlik, Michael H Breitner	Proceedings of the 14th International Conference on Wirtschaftsinformatik, Siegen, Germany	Published	C	A6
7	10/20	Smart Home in Private Households: Status Quo, Discussion, and New Insights	**Oliver Werth**, Nadine Guhr, Michael H Breitner	International Journal of Service Science, Management, Engineering, and Technology, Volume 11, Issue 4	Published	D	A7
8	12/20	Influencing Factors for the Digital Transformation in the Financial Services Sector	**Oliver Werth**, Christoph Schwarzbach, Davinia Rodríguez Cardona, Michael H Breitner, Johann-Matthias Graf von der Schulenburg	German Journal of Risk and Insurance, Volume 109, Issue 2-4	Published	C	A8
9	06/21	Classification of Real-World Microgrids Based on a Morphological Analysis	Jana Gerlach, Sarah Eckhoff, **Oliver Werth**, Tobias Kraschewski, Tim Brauner, Michael H Breitner	Proceedings of the 27th Americas Conference on Information Systems, Online Conference	Published	D	A9

#	Date	Title	Order of Authors	Outlet	Status	VHB Jourqual V3	Appendix
10	06/21	Examining Customers' Critical Acceptance Factors towards Ridepooling Services	**Oliver Werth**, Marc-Oliver Sonneberg, Max Leyerer, Michael H Breitner	Transportation Research Record: Journal of the Transportation Research Board, Volume 2675, Issue 11	Published	-	A10
11	06/21	More than Mobile Banking – A Taxonomy-Based Analysis of Mobile Personal Finance Applications	Albert Torno, **Oliver Werth**, Robert C. Nickerson, Michael H. Breitner, Jan Muntermann	Proceedings of the 25th Pacific Asia Conference on Information Systems, Online Conference	Published	C	A11
12	12/21	Design Principles for Knowledge Management Systems of Smart Services	Sonja Dreyer, **Oliver Werth**, Daniel Olivotti, Nadine Guhr, Michael H. Breitner	e-Service Journal, Volume 13, Issue 2	Published	D	A12
13	02/22	Requirements for an Open Digital Platform for Interdisciplinary Energy Research and Practice	**Oliver Werth**, Stephan Ferenz, Astrid Niesse	Proceedings of the 16h International Conference on Wirtschaftsinformatik, Online Conference	Published	C	A13
14	03/22	Influences of Digital Innovations on Advisory Work in the Financial Services Sector	Theresa Eden, **Oliver Werth**, Christoph Schwarzbach, Michael H Breitner, Johann-Matthias Graf von der Schulenburg	Die Unternehmung – Swiss Journal of Business Research and Practice, Volume 76, Issue 1	Published	C	A14
15	04/22	How is Your Mood Today? - A Taxonomy-based Analysis of Apps for Depression	Nina S. Müller, **Oliver Werth**, Claudia M. König, Michael H. Breitner	Proceedings of the 29th Americas Conference on Information Systems, Online Conference	Published	D	A15
16	12/22	Artificial Intelligence for Cybersecurity: Towards Taxonomy-based Archetypes and Decision Support	Jana Gerlach, **Oliver Werth,** Michael H. Breitner	Proceedings of the 43rd International Conference on Information Systems	Published	A	A16
17	12/22	What Determines FinTech Success? A Taxonomy-Based Analysis of FinTech Success Factors	**Oliver Werth**, Davinia Rodríguez Cardona, Albert Torno, Michael H. Breitner, Jan Muntermann	Electronic Markets - The International Journal on Networked Business	Accepted for publicati	B	A17
18		Holistic B2X Mobile Application Development – A Strategic Reference Model	**Oliver Werth**, Nadine Guhr, Michael H Breitner	-	Working paper	-	A18

Table 1. Chronological overview of publications.

1. Part A: Introduction to Digital Transformation and Mobile Application Development

1.1. Research Motivation and Relevance

The information systems research (ISR) discipline is adaptable in its application areas and methodologies. Defined as a reference discipline, ISR combines and uses viewpoints, e.g., theories or concepts from many disciplines such as mathematics or social sciences, to investigate fields on the usage of and behaviors towards information systems (IS) (Baskerville & Myers, 2002). One of these fields is the case of digital transformation (DT). Generally, DT can be defined as "a process that aims to improve an entity by triggering significant changes to its properties through combinations of information, computing, communication, and connectivity technologies" (Vial, 2019, p. 121). DT and its connected usage of technologies affect society on an individual or institutional level. For example, new competitors, e.g., FinTechs, are influenced and threatened by the financial services sector that offers unique products through (new) channels to customers. These disruptions trigger strategic decisions of the incumbent to react and modify their business model.

Furthermore, implementing digital technologies leverages changes within value creation and has negative and positive impacts on companies and society (Vial, 2019). Generally, these technologies can be fitted within the SMACIT (social, mobile, analytics, cloud, and Internet of Things (IoT)) acronym and structured within these characteristics (Sebastian et al., 2017). Consequentially, the technology that is used can take various forms, e.g., the usage of new back-end systems at financial services providers (Eden et al., 2022) or the introduction of mobile applications ("apps") for customers (Torno et al., 2021). As a result, research areas on DT are diverse, and topics must be continuously investigated to provide a knowledge base for academics and practitioners. While the investigation areas of DT and the influences accelerated by the usage of technology leaves a lot of room for investigations, this cumulative dissertation aims to present insights, e.g., chances and challenges or negative and positive impacts on the influences of DT in several business areas, i.e., energy, financial services, urban mobility, and health. Furthermore, the paper contained in this dissertation investigates the development and usage of (mobile) apps in general (Werth, Guhr, & Breitner, 2019) or with a specific look within a business area as an enabler for new products and

services (Müller et al., 2022). From a theoretical point of view, the dissertation enhances the understanding and the influences of DT on companies and customers in several business areas and technologies. Also, it provides contributions on the (non-)usage and adaptation of process models for mobile app development and presents a reference theory for mobile app development projects. The following table shows the research questions (RQs) or research objectives (ROs) that are answered in the paper that are contained in this dissertation:

#	Title	RQs / ROs	Source	Appendix
1	Make or Break. Business Model Determinants of FinTech Venture Success	RQ1: Which components of a FinTech company's business model have the highest impact on venture success?	Röder et al., 2018	A1
2	Successful Mobile Application Development: Towards a Taxonomy of Domain-Specific Process Models and Methodologies	RQ1: What process models and methodologies can be applied in the mobile application development domain, and how can they be classified?	Werth, Guhr, & Breitner, 2019	A2
3	Challenges of the Financial Industry - An Analysis of Critical Success Factors for FinTechs	RQ1: What are the distinctive critical success factors for FinTechs and general ventures?	Werth, Rodríguez Cardona, et al., 2019	A3
4	A Mixed Methods Analysis of the Adoption and Diffusion of Chatbot Technology in the German Insurance Sector	RQ1: Which socio-technical factors influence (positively or negatively) the adoption and diffusion of Chatbot technology in the insurance sector?	Rodríguez Cardona et al., 2019	A4
5	Privacy Concerns in the Smart Home Context	RQ1: How do users' concerns for information privacy influence the intention to use smart home devices?	Guhr et al., 2020	A5
6	An Empirical Study of Customers' Behavioral Intention to Use Ridepooling Services–An Extension of the Technology Acceptance Model	RQ1: Which constructs influence the customer acceptance of ridepooling?	Sonneberg et al., 2019	A6
7	Smart Home in Private Households: Status Quo, Discussion, and New Insights	RQ1: What is the current state of the literature on smart homes in context with its end-users in private households?	Werth et al., 2020a	A7
8	Influencing Factors for the Digital Transformation in the Financial Services Sector	RO1: Our research objective is to study the current topics which drive digital transformation in the sector.	Werth et al., 2020b	A8

#	Title	RQs / ROs	Source	Appendix
9	Classification of Real-World Microgrids Based on a Morphological Analysis	RQ1: Which microgrid design options can be extracted from the literature using a morphological analysis? RQ2: How can real-world microgrids be classified using the morphological box, and which implications and recommendations for future research and practice can be derived?	Gerlach et al., 2021	A9
10	Examining Customers' Critical Acceptance Factors towards Ridepooling Services	RQ1: What are the significant relationships among customers' intention to use ridepooling services, environmental awareness, price value, performance expectancy, effort expectancy, and other related variables? RQ2 What recommendations can be drawn from these relationships for ridepooling providers?	Werth et al., 2021	A10
11	More than Mobile Banking – A Taxonomy-Based Analysis of Mobile Personal Finance Applications	RQ1: How can mobile personal finance applications be classified within a taxonomy? RQ2: Which archetypes of mobile personal finance applications can be deduced empirically with this classification?	Torno et al., 2021	A11
12	Design Principles for Knowledge Management Systems of Smart Services	RQ1: What are the appropriate design principles for knowledge management systems for smart services?	Dreyer et al., 2021	A12
13	Requirements for an Open Digital Platform for Interdisciplinary Energy Research and Practice	RQ1: What are the critical requirements for an open digital platform to support interdisciplinary energy researchers and practitioners?	Werth et al., 2022b	A13
14	Influences of Digital Innovations on Advisory Work in the Financial Services Sector	RQ1: How are digital innovations influencing advisory work in the financial services sector, and what implications can be drawn?	Eden et al., 2022	A14
15	How is Your Mood Today? - A Taxonomy-based Analysis of Apps for Depression	RQ1: How applications for depression can be classified within a taxonomy? RQ2: Which archetypes of applications for depression can be empirically deduced with this classification?	Müller et al., 2022	A15
16	Artificial Intelligence for Cybersecurity: Towards Taxonomy-based Archetypes and Decision Support	RQ1: Which archetypes of AI-driven cybersecurity solutions can be deduced empirically from a taxonomy of corresponding business models? RQ2: Which dimensions and characteristics must be integrated into a decision support framework to encourage responsible stakeholders to select an adequate and efficient AI-driven cybersecurity service?	Gerlach et al., 2022	A16

#	Title	RQs / ROs	Source	Appendix
17	What Determines FinTech Success? A Taxonomy-Based Analysis of FinTech Success Factors	RQ1: Which theoretically grounded factors are potentially relevant for FinTech venture success across distinct FinTech archetypes and business model dimensions?	Werth et al., 2023, accepted for publication	A17
18	Holistic B2X Mobile Application Development – A Strategic Reference Model	RO1: The overall research objective is to accumulate our examinations and build a strategic reference model to present a blueprint for B2X mobile app development projects for various interested stakeholders, e.g., project managers or project controllers.	Werth et al., working paper	A18

Table 2. Research questions and research objectives answered in the paper contained in this dissertation

The papers in this dissertation are critically reflected regarding their limitations and fallbacks around possible missing aspects in analyzation or discussion. Therefore, a research agenda with thirteen research directions is developed and ignites structured subsequent research in these domains. Interested researchers can use this agenda for their projects and as an inspiration for more tailored research in DT and mobile app development.

1.2. Research Methods Used

Not only the topics of ISR and DT are diverse, but also the research methods that can be used for investigations. The diversity is also reflected through the mixture of techniques used within the publications on which this dissertation is based. In the following, these methodologies are presented, discussed, and set into the contexts of the publications.

Publications presented in this dissertation that used **literature reviews** as the main research methodology wanted to accumulate knowledge about a specific topic and/or derive a research agenda (Werth et al., 2020a) or were interested in the examination of, e.g., meaningful design principles (DP) for practitioners and academics (Dreyer et al., 2021). Finding and structuring relevant literature as a basis or ultimate goal of the research is one of the most important tasks of every research project (Baker, 2000). However, the challenge of covering the current state of research is becoming increasingly demanding as more research is being published and, as a result, available (Larsen, Hovorka, Dennis, & West, 2019).

Therefore, structured approaches and documentation must develop a transparent and comprehensible search process regardless of the ultimate research goal. While the seminal work of Webster and Watson (2002) highly influenced the IS community, other researchers refined the analyzation procedure of the found literature (e.g., Wolfswinkel, Furtmueller, & Wilderom, 2013) or proposed concrete steps that should be taken into account during a literature review process (e.g., vom Brocke et al., 2015). A literature search process should ideally include different search methods and databases (Paré, Tate, Johnstone, & Kitsiou, 2016). Both mentioned papers in this dissertation identified and structured literature on a research subject and comprehensively documented the literature search process. However, the presented literature reviews are influenced by the decision of databases and keywords and other exclusion criteria, e.g., publication dates. Also, analyzing the found data, i.e., academic articles, is part of a subjective process by the authors and should be considered as a limitation. In the following an example of a documented and structured literature review process is shown and can be found below from Dreyer et al. (2021). A systematic literature search was performed to identify databases and search terms, applying formal criteria (inclusion/exclusion criteria), and forward and backward-searches.

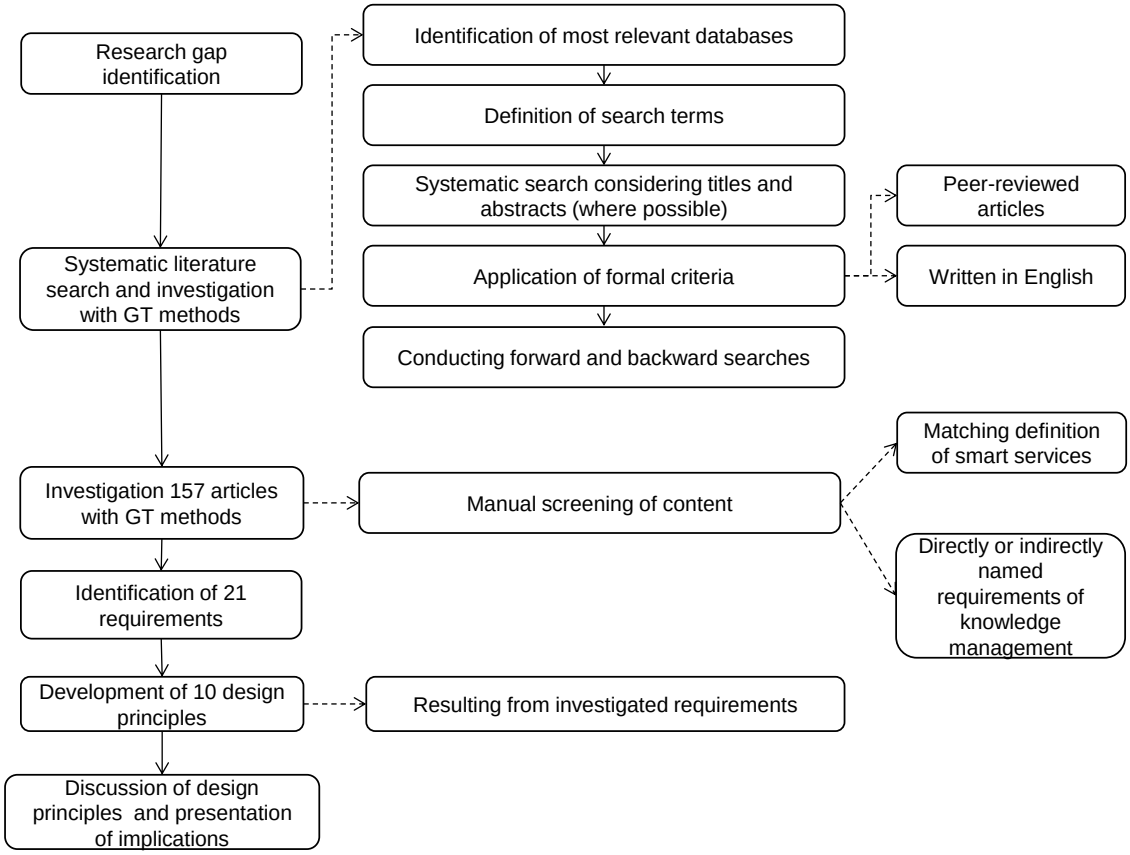

Figure 5. Literature search procedure by Dreyer et al. (2021, p. 33)

Other publications mainly focus their methodology and design on **qualitative approaches**, like expert interviews (Werth et al., 2022b) or in-depth case studies interviewing involved people in organizations (Eden et al., 2022). Qualitative research methods are useful if the information on a specific domain or topic is limited or participants are invited to articulate their opinions and feelings about a certain phenomenon (Gioia, Corley, & Hamilton, 2013; Myers & Newman, 2007; Yin, 2018). In the paper contained in this dissertation, semi-structured interviews were performed with a pre-defined interview guideline to ensure reliability (Silverman, 2016). Interview transcripts were analyzed and coded with methods borrowed from Grounded Theory (GT) (Glaser & Strauss, 2010). GT can be used either as a coding method or for theory generation (Charmaz, 2014). In qualitative research, it is important to document the acquisition process of interview partners and to prove that they have a certain level of knowledge about the topic to study. However, the selection of interview partners for expert interviews (within a case study) can be driven by a selection bias of the researchers (Myers & Newman,

2007). Also, for case studies, it is important to explain the phenomenon that is investigated in light of the overall situation, e.g., the economic conditions of a company (Wynn & Williams, 2012). In the case of the paper by Eden et al. (2022), the current situation of the investigated financial services providers is explained regarding the situation in the financial markets in Germany. An example of a detailed description of interview participants is from Werth et al. (2020b), shown in the table below. Here, interview partners were anonymized, and profiles of the interviewees show the level of knowledge about the phenomenon, i.e., DT in the financial services sector.

Interview	Expert	Company / Institution	Sector	Profile of Interviewee
1	1A	Consulting A	Banking	1A has been consultant since 26 years for banks as well as expert for digital services and team lead of around 200 employees.
2	2A	Consulting B	Banking/Insurance	2A has been consultant since 12 years and has previous expertise as trained insurance salesperson. The interviewee is responsible for consulting of banks and insurance companies as well as labor unions and employers associations in the financial services sector.
3	3A	Consulting C	Insurance	3A is team lead of the insurance sector at consulting company C. The person is consultant for insurance companies since 18 years.
4	4A	Consulting D	Insurance	4A has a PhD in economics with focus on insurance economics. The interviewee is senior manager at consulting company D and has 22 years of expertise with digital transformation in the insurance sector.
5	5A	Consulting A	Insurance	5A studied Mathematics and Finance, and has worked within many digital transformation projects in banks and insurance companies. Since 2014 is consultant for insurance companies at Consulting A.
6	6A	Insurance Practitioners Journal A	Insurance	6A is journalist for the insurance sector and industry expert since 25 years.
7	7A	Employers Association A	Banking	7A main responsibilities have a focus on tariff politics for employers' association A. The expert is representative for banks in tariff negotiations for 11 years.
8	8A	Employers Association B	Banking	8A studied economics and legal studies. The interviewee is the lead of employers association B and is interest representative of banks since 5 years.
9	9A	Employers Association C	Insurance	9A is responsible for digitalization at employers' association C. The interview partner studied insurance economics and is since 10 years expert for digital transformation projects in the insurance sector.
	9B	Employers Association C	Insurance	9B studied economics and earned a PhD in economics. Since 8 years, 9B is leading representative at employers association C for insurance companies.
10	10A	Labor Union A	Banking	10A is workers' representative at labor union A since 2 years. The interviewee is responsible for digital transformation projects and corresponding conflicts within the banking sector.

Inter-view	Ex-pert	Company / Institution	Sector	Profile of Interviewee
11	11A	Labor Union A	Bank-ing	11A has the area lead for financial services companies at labor union A. Since 28 years, 11A is representative at labor union A for banks.
	11B	Labor Union A	Bank-ing	11B is IT-consultant for labor union A for 2 years. The interview partner studied economics and was the former CEO of an IT consulting com-pany for the banking sector.
	11C	Labor Union A	Bank-ing	11C has 22 years of experience in banking. Since 2 years 11C work for labor union A and is specialized in IT solutions and contact person for banks and work councils.
12	12A	Labor Union A	Insur-ance	12A is the coordination of tariff politics in the insurance sector for labor union A since 3 years. The interview partner is the contact for several work councils in the insurance sector.

Table 3. Interview demographics by Werth et al. (2020b, pp. 163–164)

Another steam of methodology used was **quantitative examinations** that used Structural Equation Modeling (SEM) as the underlying analysis method (Sonneberg et al., 2019; Werth et al., 2021). In these papers, surveys and hypotheses based on existing technology acceptance theories and academic literature were developed and implemented in an online-tool. The aim was to test (additional) constructs and relationships from well-known acceptance theories in the context to ridepooling services. Therefore, SEM has used an analytical method. SEM is a standard methodology for hypothesis testing (Gefen, Rigdon, & Straub, 2011). A structural (shows the relationships between constructs) and a measurement (investigates the relationships between latent constructs) model are estimated simultaneously, e.g., with resampling through bootstrapping procedures (Hair, Hult, Ringle, & Sarstedt, 2022). SEM can take two forms: Covariance-based (CB) and partial least squares (PLS-)based SEM. While the CB-SEM is preferable when theories should be tested and confirmed, PLS-SEM is advantageous if data is not normally distributed. The exploration of theoretical extensions is the focus of research (Hair et al., 2022). Consequentially, PLS-SEM was used for both studies and performed with the software SmartPLS. The paper in this dissertation that applies SEM follows the guidelines for PLS-SEM by Hair et al. (2022). PLS-SEM has become very popular in ISR, but not without criticism, e.g., using small sample sizes that can yield errors (Westland, 2010). There are several other methodologies available, e.g., LISREL (Jöreskog & Sörbom, 2001), that can be used for SEM. Furthermore, in PLS-SEM, like in further survey-based research,

the data collected should be discussed considering its generalizability to the investigated population. As a best-practice standard, the results of PLS-SEM studies are visualized in a structural model. The structural model below shows the results of a PLS-SEM calculation with bootstrapping procedures with Beta, significance levels, and R^2-values.

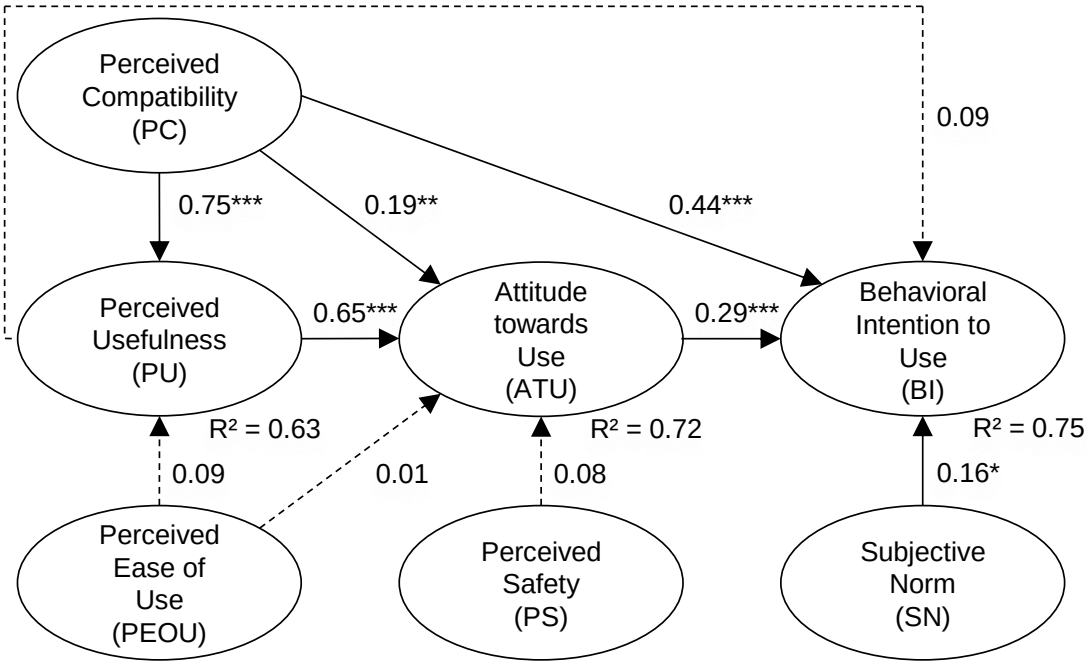

Figure 6. Results and findings of the PLS-SEM procedure by Sonneberg et al. (2019, p. 10)

Qualitative and quantitative approaches can also be used in one paper. This dissertation contains one **mixed-method** study, that aims to produce a meaningful knowledge base on acceptance factors for chatbots (Rodríguez Cardona et al., 2019). Generally, mixed-method studies collect, combine, and analyze data derived from quantitative and qualitative approaches (Creswell & Plano Clark, 2018). In the paper of Rodríguez-Cardona et al. (2019), a dominant qualitative phase was followed by a less-dominant quantitative data collection phase (Tunarosa & Glynn, 2017). The application of mixed-method approaches is useful, if a specific phenomenon should be investigated in a qualitative and quantitative way. With this, researchers are able to combine and analyze the phenomenon with several data sources, e.g., interview transcripts and survey data. In result, a more detailed discussion and interpretation is possible, that an application

of one method cannot deliver. However, mixed-method studies and their underlying procedures should be well documented. Furthermore, they can be time-consuming regarding data collection and analyzation , i.e., triangulation (Almalki, 2016; Creswell & Plano Clark, 2018).

Lastly, **taxonomic approaches** were used (Kundisch et al., 2021; Nickerson, Varshney, & Muntermann, 2013), and their results were evaluated. Generally, taxonomies aim to structure and organize a domain of interest and are suitable for building in-depth knowledge about the objects, e.g., mobile apps in a specific domain (Nickerson et al., 2013). Positioned within the DSR paradigm, a taxonomy as a structure-giving artifact is used to understand issues that can be analyzed further (Hevner, March, Park, & Ram, 2004; Kundisch et al., 2021). Currently, it is the “most prominent and widely used approach in the field” (Schöbel, Janson, & Söllner, 2020, p. 647). Several steps follow taxonomic approaches: The determination of meta-characteristics and ending conditions, the execution of empirical-to-conceptual and/or conceptual-to-empirical approaches, and a check if the ending conditions are fulfilled after each iteration performed (Nickerson et al., 2013). DSR is interested in delivering problem-solving artifacts for interested stakeholders. Therefore it is important to evaluate DSR artifacts regarding, e.g., their usefulness and usability (Venable, Pries-Heje, & Baskerville, 2016). The same holds for constructed taxonomies (Kundisch et al., 2021). The paper in this dissertation that used this methodology was interested in identifying patterns and similarities between objects like mobile apps, e.g., in the health sector (Müller et al., 2022). Also, archetypes between those objects were identified as a starting point for further research (Torno et al., 2021). Taxonomies in this dissertation were evaluated, e.g., through subsequent clustering analysis (Müller et al., 2022), expert interviews (Werth et al., working paper), and/or with the development of decision trees (Gerlach et al., 2022). Gerlach et al. (2021) performed a **morphological analysis**. In their paper a morphological box on microgrids is presented. In the last years, researchers use morphological boxes to visualize taxonomies (Möller, Haße, Azkan, van der Valk, & Otto, 2021; Ritchey, 2011). These morphological taxonomies aim to produce a illustrative way to show the design dimensions and characteristics of specific objects, i.e., *Gestalt* (Möller et al., 2021; Ritchey, 2006, 2014). It can be assumed that the differences and

delimitations between taxonomies and morphological boxes blur. Morphological boxes or morphological taxonomies are visual representations of taxonomies. However, they can provide meaningful prescriptive advice on design configurations of specific objects (Möller et al., 2021). This advances the more descriptive visualizations and nature of taxonomies that do not deliver precise guidance on design configurations.

However, DSR and taxonomy building processes are ideally iterative in their nature to advance the developed DSR artefact. A limitation, that is discussed later in this dissertation. The following figure presents a typical visualization of a taxonomic process for a taxonomy for FinTech success factors. Here, all steps are supplemented with information for the reader about which concrete steps were performed during the development process:

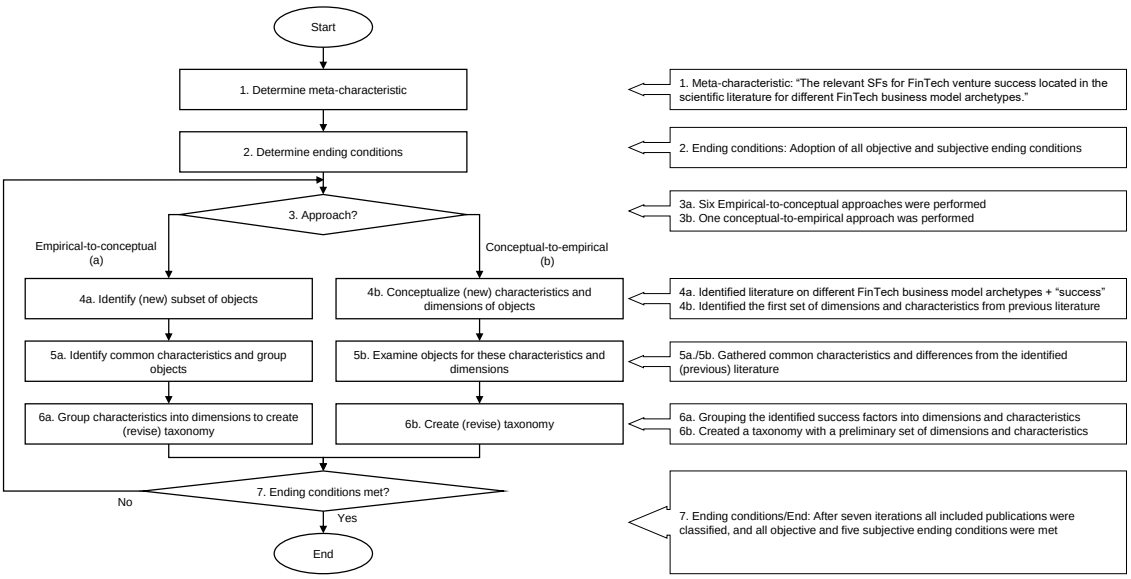

Figure 7. Adapted taxonomy development process by Werth et al. (2023, accepted for publication)

Truly, all designs and methods presented have chances and challenges with their associated usage that should be discussed. However, this discussion also leaves room for improvement and further research. Subsequently, these fallbacks were discussed in the corresponding parts of this dissertation. The following table summarizes and provides an overview of the methods used within the publications:

Research Method(s) Used	Reference(s)
Literature Review	Werth et al., 2020a
Literature Review, Morphological Analysis	Gerlach et al., 2021
Qualitative Approach / Case Study	Eden et al., 2022; Werth et al., 2020b; Werth et al., 2022b
(Survey-based) Quantitative Approach	Guhr et al., 2020; Röder et al., 2018; Sonneberg et al., 2019; Werth et al., 2021
Mixed-Methods	Rodríguez Cardona et al., 2019
Literature Review	Dreyer et al., 2021
Taxonomy Development and Evaluation	Gerlach et al., 2022; Müller et al., 2022; Torno et al., 2021; Werth et al., working paper; Werth et al., 2023, accepted for publication; Werth, Guhr, & Breitner, 2019

Table 4. Overview of the research methods used within the publications

1.3. Structure of the Dissertation

The dissertation is structured into six parts. After having already given an overview of research methods, an introduction to DT and app development (Part A), the rest of this dissertation is arranged thematically. Part B describes and discusses the implications of app development. Part C is oriented on considerations and remarked on DT in the energy sector. DT also influences the financial services sector. Papers that discuss and present implications on these influences are presented in Part D. While I also investigated DT in several other business areas, e.g., the health sector, I summarized these findings in Part E. The dissertation closes with a critical appraisal, a further research agenda on possible topics, and concluding remarks in Part F. In each part, the content of the publications is briefly summarized and discussed in a broader context on DT. Figure 2 visualizes the overview of the parts and publications contained in this dissertation.

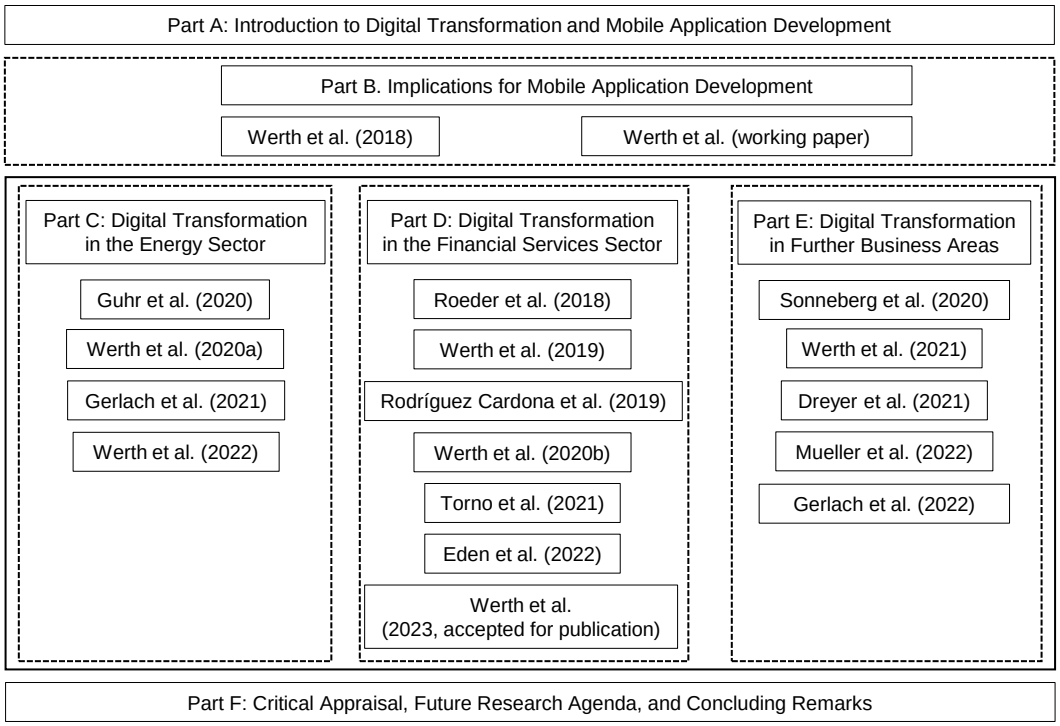

Figure 8. Overview of the parts and publications in this dissertation

2. Part B: Implications for Mobile Application Development

2.1. A Taxonomy of Process Models and Methodologies for Mobile Application Development

Mobile apps play an important role as an enabler in the phenomenon of DT. While their implementation is investigated from a general perspective without being restricted to a specific business area, they are discussed first in this dissertation. They can be used and implemented to enable changes in the value chain process of companies (Vial, 2019). Companies can reach customers on their own mobile devices through mobile apps and strengthen their closeness to them. In addition, mobile apps offer companies new possibilities as a digital channel to communicate and deliver products. While the economic chances of mobile apps are numerous, the following part deals with the construction and development of mobile apps. As a result, this part of the dissertation is based on two contributions to mobile app development. Studying mobile app development is important since methods from classical software development can be used only to some extent (Singh & Soni, 2017). Therefore, domain-specific examinations on mobile app development are needed that take the specificities of these technological artifacts into account.

The research of Werth et al. (2019) examined and identified process models and methodologies for mobile app development. They used the taxonomic approach for taxonomy development proposed by Nickerson et al. (2013). Their approach with four iterations led to 16 objects identified, i.e., process models and methodologies, five dimensions, and twelve corresponding characteristics. While to the date published in 2019, their paper was the first that examined those objects in a structured manner with a taxonomic approach. Most of the identified process models were incremental and provided prototyping. As contributions, the provided taxonomy lays a knowledge foundation for (advanced or new) mobile app developers to choose an appropriate process model (Werth, Guhr, & Breitner, 2019). From an academic perspective, the provided information from the taxonomy can be used as a basis for more tailored process models on mobile app development. However, their examination lacks an evaluation of the taxonomy with, e.g., third-parties and is, therefore, more on an observational basis by the authors. Artifact evaluation is an important step in DSR since it aims to provide

problem-solving solutions (Gregor & Hevner, 2013; Hevner et al., 2004). Taxonomies, as an output of DSR, should be evaluated in light of the purpose of the taxonomies (Kundisch et al., 2021). Furthermore, taxonomies should be constantly observed concerning completeness and comprehensiveness. Objects included are an iterative process in taxonomy development through the conduction of empirical-to-conceptual approaches. However, authors may oversee existing relevant objects, i.e., process models and methodologies for mobile app development. Also, the current state of literature can be included through another conceptual-to-empirical. Taxonomies, in general, have an expandable nature (Nickerson et al., 2013). Therefore, these DSR artifacts can be advanced, which is the case in the second paper of this dissertation.

2.2. Towards a Strategic Reference Model for B2X Mobile Application Development

As a step forward against these backgrounds, Werth et al. (Working paper) built on the taxonomy and results identified by Werth et al. (2019). First, they expanded the taxonomy of Werth et al. (2019) with current literature and identified new objects from Jabangwe et al. (2018) and the most recent literature. They presented a more comprehensive taxonomy, as depicted in the figure below. The taxonomy expansion led to nine process models with the same specifics. With iterative phases, high development effort, basic knowledge of the client or client/customer requirements, incremental prototyping, and involving stakeholders regularly in the Business-to-X (B2X, "X" for business, customer, etc.) mobile app development process (Werth et al., working paper). However, as Jabangwe et al. (2018) note, practitioner do not use process models and methodologies from literature. Therefore, Werth et al. (Working paper) conducted semi-structured interviews with individuals involved in a typical B2X mobile app development process to examine this research-practice divide.

Process models (alphabetical)	Core taxonomy dimensions													
	Mobile application specification		Phases			Development efforts		Requirements of clients/customers		Prototyping		Involvement of the client/customer		
	Characteristics													
	Yes	No	Sequential	Iterative	Parallel	Low	High	Partially-known	Well-known	None	Incremental	Singular	Regular	Permanent
CDM		x			x	x		x			x		x	
CSDM		x		x		x			x		x	x		
DSDM		x		x		x		x			x		x	
FDD		x	x				x		x		x			x
IDM		x			x		x	x			x		x	
RUP		x		x			x	x			x			x
SCRUM		x		x			x		x		x		x	
SM		x		x			x	x			x		x	
VM		x		x			x	x		x			x	
WM		x	x			x			x	x		x		
XP		x		x		x		x			x			x
3D	x		x			x			x		x	x		
AppSpec	x			x			x		x		x	x		
InterMod Methodology	x			x			x	x			x		x	
IPM	x			x			x	x			x		x	
LAWA	x			x			x	x			x			x
LSD	x			x			x	x			x			x
MADLC	x			x		x		x			x		x	
Magni	x			x			x	x			x		x	
MASAM	x			x			x	x			x			x
miSEL-sdp	x			x			x	x			x		x	
Mobile Development Process Spiral	x			x		x		x			x		x	
Mobile-D	x			x			x	x			x		x	
MobiPDA	x			x		x			x		x	x		
PM1	x		x				x		x		x		x	
PM2	x			x			x	x			x		x	
PM3	x		x			x			x	x		x		
PM4	x			x			x		x		x	x		
PM5	x		x				x	x			x	x		
PM6	x			x			x		x		x	x		
PM7	x			x			x	x			x		x	
PM8	x			x		x		x		x		x		
PS9	x			x			x	x			x		x	
VEDILS	x			x		x			x		x		x	

Figure 9. Taxonomy of process models and methodologies according to Werth et al. (Working paper)

They used this taxonomy as a knowledge background for their subsequent interview situations with involved individuals. Based on these interviews, they synthesized REMOB, a strategic **re**ference model for B2X **mob**ile app development (see figure below). Overall, their results can be represented within four main layers (management, requirements, processes, and communication). The paper reveals that especially agile working cultures and stakeholder commitment are crucial for app development in the mobile are. Also, special requirements like the operating system and graphical user interface must be considered. While the process has a strong connection and specificity to B2X mobile app development, subsequent testing and communication are also important (Werth et al., working paper). REMOB goes beyond existing process models and leads to more in-depth theoretical explorations and knowledge foundations for, e.g., project leaders or project controllers within B2X mobile app development projects. The strategic reference model can serve as a blueprint for development projects and as decision support for crucial factors that must be considered within such projects.

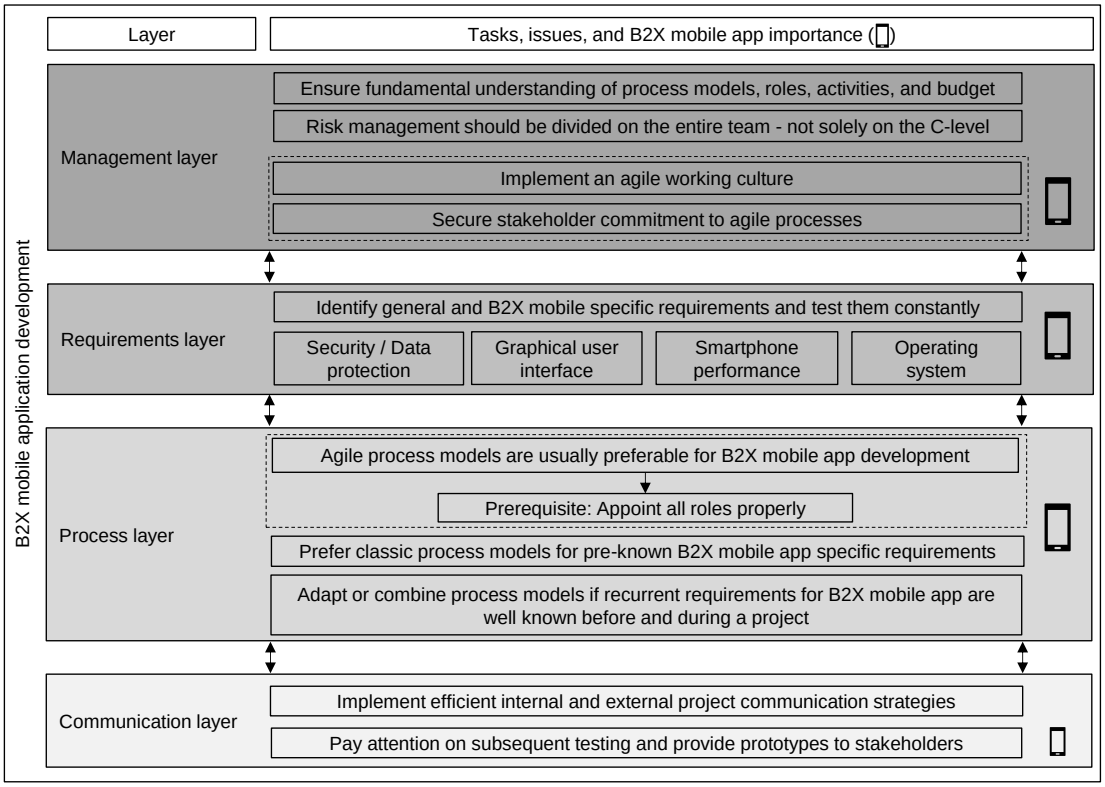

Figure 10. The strategic reference model for holistic B2X mobile application development (REMOB) by Werth et al. (Working paper)

3. Part C: Digital Transformation in the Energy Sector

3.1. Digital Transformation in the Energy Sector – Towards Interdisciplinary Energy Research and Practice

This section of the dissertation deals with DT in the energy sector, which is highly influenced by the challenges of post-fossil power generation and sustainability. Furthermore, ongoing renewable energy generation and distribution lead to new business areas and new research possibilities. Accelerated by new technologies and interconnections of market participants in the energy sector, new academic knowledge bases are necessary. Energy research involves diverse stakeholder views besides researchers, e.g., opinions and statements from energy providers. In addition, interested citizens read news about and are affected by energy research results. However, these views and interests of the diverse stakeholder should be connected on a digital Research and Development (R&D) platform to efficiently foster communication in the energy sector (A. Malhotra, Schmidt, & Huenteler, 2019). The paper of Werth et al. (2022b) examines and discusses crucial requirements derived from 36 semi-structured interviews with experts from the energy sector. It answers what the critical requirements for an open digital platform to support interdisciplinary energy researchers and practitioners are. Based on preliminary literature analysis, they identified five main elements that should be combined within such a platform, as depicted in the following figure:

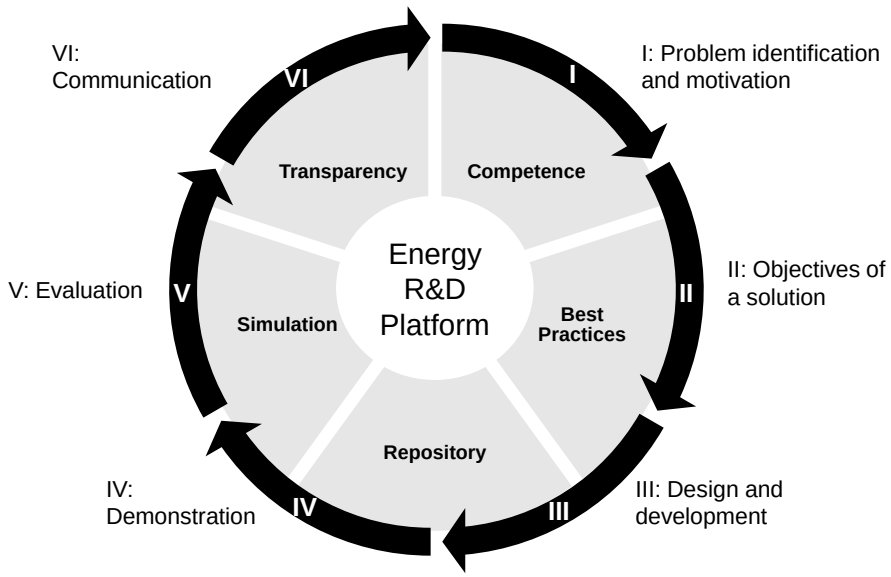

Figure 11. Service elements of the platform from Werth et al. (2022b, p. 6)

The competence element can help to identify the research partners like scientists or companies and provides a detailed overview of the participants on the platform. For example, research focus, as well as publications, can be shown. The best practices element will provide best practices in research projects to support the cooperation and coordination between the partners. Simulation models and input data are provided in the repository element. Besides the availability of models and data, the planned platform will consider reusability and adaptability. Consequentially, the repository defines common interfaces between models and data. Simulation helps combine models and use their predictive power by addressing typical use cases. A special focus here is the combination of open-source and non-open-source software and the integration of existing laboratory infrastructure. The transparency element will help scientists to present their research and results to various stakeholders. For example, short articles, white papers, and opinions can be uploaded (Werth et al., 2022b).

With the interviews, the authors received a meaningful set of requirements that serve as an academic knowledge base for an ongoing development process. For example, the information provided in the platform should be reliable or have a clear, practical value, e.g., for practitioners in the sector (Werth et al., 2022b). However, their examination lacks the views of citizens. Furthermore, the requirements are only a first step toward implementing the planned platform. Consequently, efficient development and deployment leave room for further research inquiries.

3.2. Digital Transformation and Smart Homes

Two papers in this dissertation deal with smart homes (SHs) and privacy concerns connected to the usage of SH. Increasing DT and new technologies foster the growing interest in SH technologies in a private context. According to Aldrich (2003, p. 17), an SH has defined as “[…] a residence equipped with computing and information technology which anticipates and responds to the needs of the occupants, working to promote their comfort, convenience, security and entertainment through the management of technologies within the home and connections to the world beyond.” SH technologies are able, but not limited to, to opti-

mize heating and residential cooling and energy consumption and costs. However, the spread of the technologies also leaves potential room for researchers concerning their intended end-users. The paper of Werth et al. (2020a) summarized and synthesized academic literature on this topic. While, to date, the first literature review on SH with a focus on its end-users was conducted, they lay a meaningful agenda for future research. Following the structured approach for literature reviews by Webster and Watson (2002), they identified three main categories in the literature of SH with a perspective to its end-users, i.e., general issues like ethical factors, areas of applications like energy management, and end-user-specific concepts like security or privacy concerns. According to the paper, academics should be aware of ethical issues, cultural differences, and a broader view of application areas of SH when investigating these IT artifacts.

The paper of Guhr et al. (2020) builds on a quantitative survey-based examination of privacy concerns in an SH context. They use the Technology Acceptance Model (TAM) (Davis, 1989), Internet Users' Information Privacy Concerns (N. K. Malhotra, Kim, & Agarwal, 2004), the Mobile Users' Information Privacy Concerns (Xu, Sumeet Gupta, Rosson, & Carroll, 2012) and the Theory of Planned Behavior (Ajzen, 1991) as the underlying theoretical foundation for their research. The results of the SEM procedure can be found in the following figure:

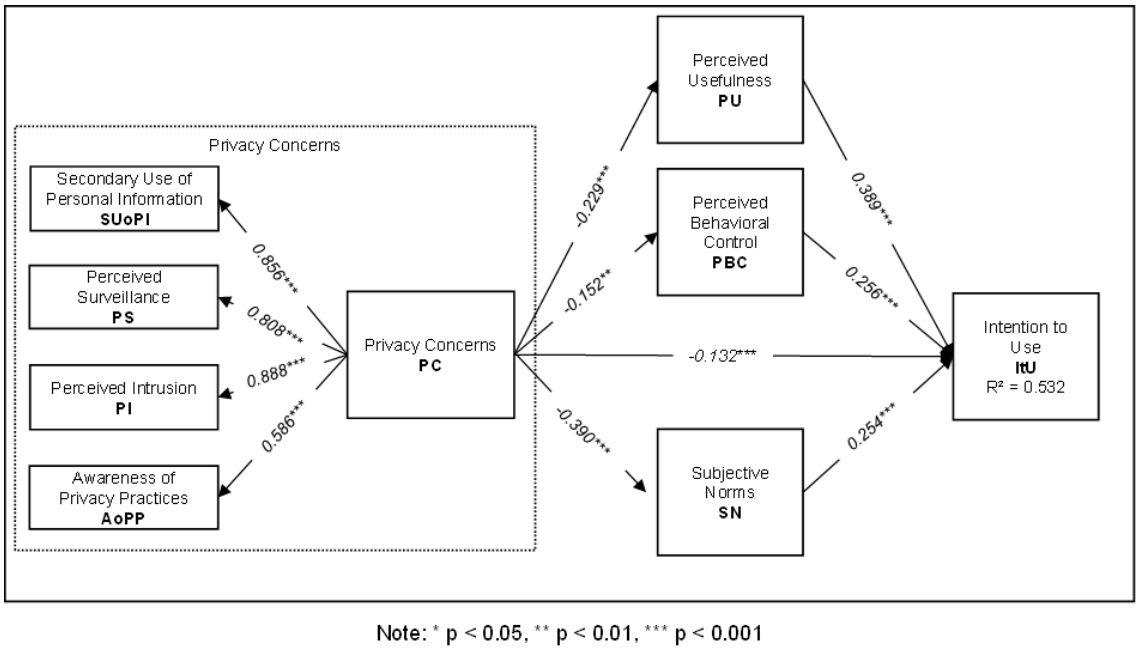

Figure 12. Overview of the results and findings by Guhr et al. (2020, p. 8)

Guhr et al. (2020) found that privacy concerns. i.e., secondary use of information perceives surveillance and perceived intrusion influence the intention to use SH devices. However, perceived usefulness, perceived behavioral control, and subjective norm were positive predictors of the intention to use SH. They derived an R^2 of 0.532, showing that still around 47 percent of variables where uninvestigated by their model and offer room for future research. The paper contributed to the literature on how and why privacy concerns influence end-users SH usage. Practitioners can use the paper to orient their own SH offerings and privacy-related features.

3.3. Implementations of Technologies in the Energy Sector

One paper contained in this dissertation deals with specific implementations of technologies in the energy sector. One of these implementations can be located within microgrids, which are defined as “low-voltage distribution systems with distributed energy sources, devices and controllable loads operated connected to the main power network or islanded, in a controlled, operated way," according to the European Commission (2011). While the energy sector and its research is

interdisciplinary by nature and involves several stakeholders, the topic of microgrids does not make an exception. Technology manufacturers or energy providers work together with researchers to construct microgrid solutions. The completed research by Gerlach et al. (2021) investigated the dimensions and characteristics of microgrid design possibilities. Using morphological analysis (Ritchey, 2011; Zwicky, 1967), they identified 18 dimensions with 60 characteristics organized into five overarching layers (governance, business, intelligence, communication, and a physical one). From this morphological analysis, they provided a meaningful future research agenda about several factors, like social aspects of the implementation of microgrids. Furthermore, they provided practical guidance toward microgrid design (Gerlach et al., 2021).

DT in the energy sector derives meaningful research directions. While the paper presented in this dissertation is mainly concerned with an efficient communication platform for practitioners and academics, SH, and microgrids, they also reveal promising FRDs that will be presented in Section 6 of this dissertation.

4. Part D: Digital Transformation in the Financial Services Sector

4.1. Digital Transformation in the Financial Services Sector – A General View

DT heavily influences the financial services sector. This section discusses six published publications and one currently under review (Werth et al., 2023, accepted for publication). Regulatory issues influence incumbents in the financial services sector and are threatened by new market entrants, e.g., so-called FinTechs. Generally, FinTechs can be defined as companies that “operate at the intersection of financial products and services and information technology. They are usually relatively new companies (often startups) with their innovative product or service offerings” (Eickhoff, Muntermann, & Weinrich, 2017, p. 2).

On the other hand, these new market entrants must be scientifically investigated towards more tailored research and discussed regarding their role in the entire sector. However, a more general examination of influencing factors for DT in the financial services sector comes from Werth et al. (2020b). With their qualitative approach, i.e., interviews with experts from the financial industry, they took a closer look at banks and insurance companies. They used Porters Five-Forces (Porter, 1980) and the Political-Environmental-Social-Technological (PEST)-model (Aguilar, 1967) as the underlying theoretical backbone. They investigated their interview transcripts with methods borrowed from grounded theory (Strauss & Corbin, 1990). This “up-front-theory” can be found in the following figure:

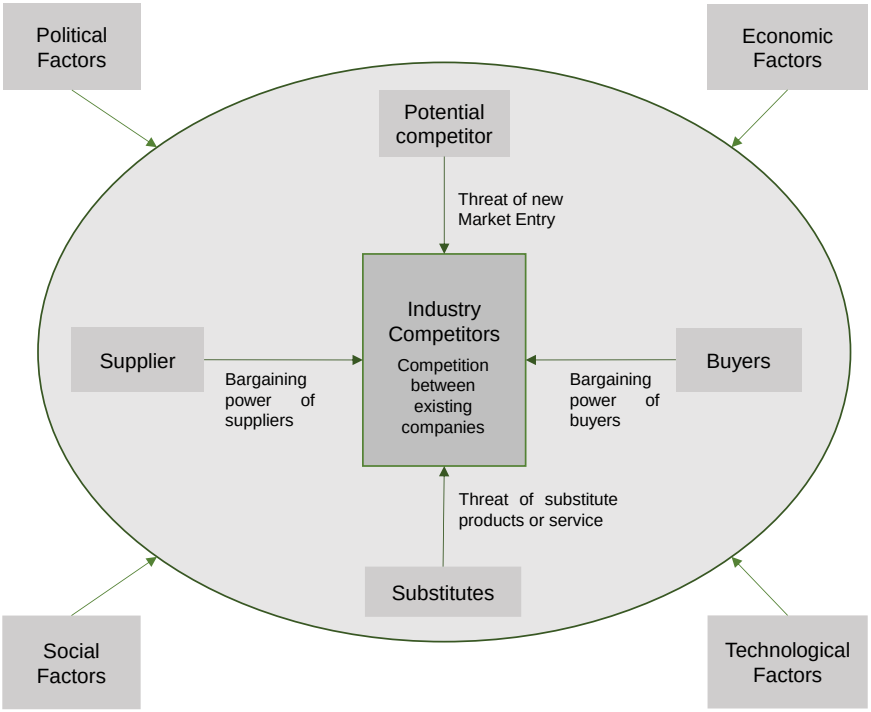

Figure 13. Combination of Porter's Five Forces (meso-level or industry-internal influences) and PEST-analysis according to Werth et al. (2020b, p. 160)

However, the paper of Werth et al. (2020b) took an overall perspective into the market, identifying main trends in the sector on an internal and external level. As a result, they identified that banks and insurance companies face quite the same challenges concerning DT, but the overall impact is perceived as higher in the banking industry. The biggest threats for incumbents are the market entrants of BigTechs (Google, Amazon, Facebook, Apple) or FinTechs. They determined that the character of the development within the financial services sector was more evolutionary rather than disruptive. Incumbents faced the challenge of modernizing their back-end systems and in-house structures to provide new customer-oriented services. However, the investigation lacks a detailed analysis of changes within financial services providers, e.g., insurance companies or banks, separately. Furthermore, they did not investigate these new market entrants in more detail.

4.2. Digital Transformation and FinTechs

Three of the papers in this dissertation's section deal with the phenomenon of FinTechs. FinTechs are worth investigating since their integrative behavior of technology, entrepreneurship, and innovation differ. Critical success factors (CSFs) must be carefully examined because venture capital is essential for these companies' short- and long-term survival. The paper of Röder et al. (2018), for example, found through a quantitative approach that product/service offering is crucial for success. To be more precise, credit lending, financing, and information aggregation seem valuable for new ventures.

Werth at el. (2019) followed another approach to identify critical success factors for FinTechs. Their interviews, analyzed with grounded theory methodologies, with FinTech founders and venture capitalists resulted in a list of 15 factors, while six of them have a direct connection to FinTech ventures. Success factors that have a relevant influence on ventures in general, and also for FinTechs, are, e.g., team compositions, a broad product/market fit, and a focus on a possible internationalization strategy. FinTechs, in special, should have, e.g., a technological advantage and a Business-to-Business (B2B) focus on their service provided. Also, founders should have regulatory knowledge of the sector, and FinTech should foster incumbent partnerships. From a more investor-oriented perspective, FinTechs should have, e.g., growth potential and provide exit options for venture capitalists (VCs). The results of the paper are visualized in the following figure:

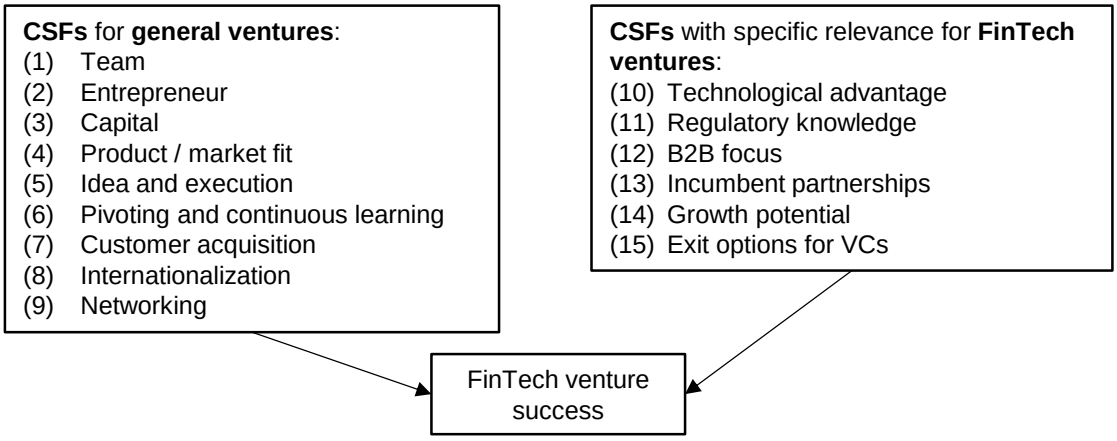

Figure 14. Critical success factors for FinTechs, according to Werth et al. (2019, p. 5)

Their journal paper shed light on relevant success factors for FinTechs, revealed from interviews with individuals from (potential) investors and FinTech founders. Practitioners can use the results as a knowledge base and a broader discussion on what is relevant for the survival and success of these digital ventures (Werth, Rodríguez Cardona, et al., 2019).

A taxonomy-based content analysis continues the research about success factors of FinTechs came from Werth et al. (2023, accepted for publication) and is depicted in the following figure:

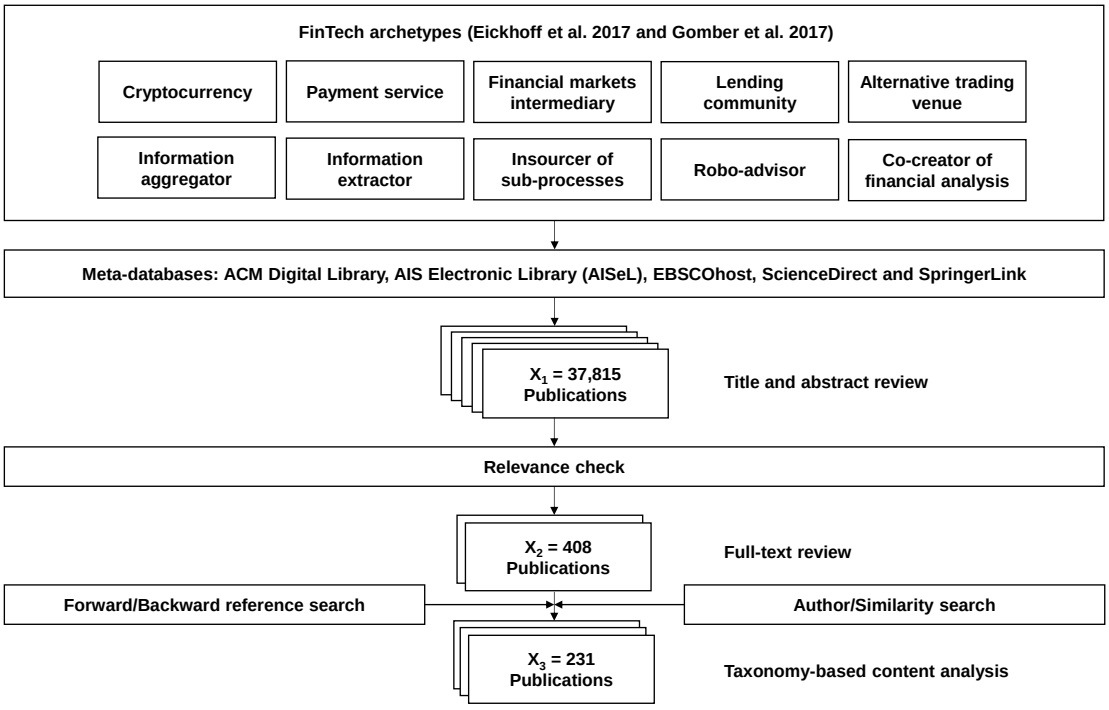

Figure 15. Literature search process by Werth et al. (2023, accepted for publication)

In the paper of Werth et al. (2023, accepted for publication), ten lateral literature searches in academic databases were conducted according to the archetypes for FinTechs identified by previous researchers (Eickhoff et al., 2017; Gomber, Koch, & Siering, 2017). Followed by relevance checks, forward/backward searches, and similarity searches, they performed a content-analysis of 231 scientific papers concerned with success factors related to one or more of the identified archetypes. Identified success factors were structures among seven dimensions and 31 corresponding characteristics. Their analysis of over 231 scientific papers

reveals success factors like security, privacy and transparency, technology adoption, user trust, and the cost-benefit dynamic of the innovation as relevant for the success of FinTechs. However, no relevant literature for the archetypes of “financial markets intermediary” and “information extractor” were found, as seen in the following figure.

	D1 Strategic factors				D2 Operational factors					D3 Technological factors					D4 Value proposition						D5 User factors						D6 Economic factors		D7 Environmental factors			Cumulative percentage per FinTech archetype
	$C_{1,1}$ Corporate plan	$C_{1,2}$ Operational design	$C_{1,3}$ Competitive plan	$C_{1,4}$ Marketing plan	$C_{2,1}$ Competency-based human resources	$C_{2,2}$ Strategic networks and alliances	$C_{2,3}$ Operational alignment	$C_{2,4}$ Cost-benefit dynamic of the innovation	$C_{2,5}$ Efficiency	$C_{3,1}$ Technology integration	$C_{3,2}$ Technology adoption	$C_{3,3}$ Security, privacy and transparency	$C_{3,4}$ Environmental sustainability	$C_{3,5}$ Ethical issues	$C_{4,1}$ Convenience/usability	$C_{4,2}$ Customization	$C_{4,3}$ Intermediation	$C_{4,4}$ Monetary	$C_{4,5}$ Disintermediation	$C_{4,6}$ Decision support	$C_{5,1}$ User socio-economic characteristics	$C_{5,2}$ User centricity	$C_{5,3}$ User trust	$C_{5,4}$ User-perceived quality	$C_{5,5}$ Cost attractiveness	$C_{5,6}$ Ease of use	$C_{6,1}$ Financial capital	$C_{6,2}$ Cost structure	$C_{7,1}$ Industry rivalry	$C_{7,2}$ Market conditions	$C_{7,3}$ Regulation	
Alternative trading venue	3%	4%	3%	4%	2%	7%	2%	3%	2%	6%	10%	4%	0%	0%	0%	0%	8%	4%	1%	0%	4%	4%	6%	6%	0%	3%	5%	1%	3%	2%	3%	100 %
Co-creator of financial analysis	9%	6%	11%	0%	9%	6%	3%	6%	6%	0%	6%	14%	0%	0%	0%	0%	0%	0%	0%	9%	0%	0%	3%	0%	0%	3%	0%	3%	6%	0%	3%	100 %
Cryptocurrency	0%	4%	4%	1%	0%	7%	3%	7%	4%	9%	8%	10%	1%	1%	0%	0%	1%	3%	5%	0%	2%	0%	5%	1%	2%	2%	0%	7%	2%	4%	8%	100 %
Information aggregator	0%	6%	0%	0%	6%	6%	0%	19%	6%	0%	0%	6%	0%	0%	0%	0%	6%	0%	0%	0%	6%	0%	6%	6%	6%	0%	6%	0%	0%	6%	6%	100 %
Insourcer of sub-processes	2%	8%	7%	1%	3%	4%	1%	5%	4%	6%	8%	9%	1%	0%	8%	0%	0%	0%	0%	0%	3%	2%	4%	5%	4%	3%	1%	6%	4%	3%	3%	100 %
Lending community	0%	3%	1%	4%	1%	3%	1%	1%	1%	15%	16%	1%	0%	0%	1%	0%	12%	1%	0%	0%	9%	5%	4%	4%	0%	3%	7%	0%	4%	1%	0%	100 %
Payment services	4%	2%	7%	0%	1%	5%	0%	2%	1%	10%	8%	7%	0%	0%	2%	2%	3%	0%	0%	0%	5%	3%	11%	2%	3%	7%	0%	2%	4%	3%	4%	100 %
Robo-advisor	0%	4%	4%	7%	4%	0%	0%	0%	7%	4%	4%	11%	0%	0%	0%	0%	0%	0%	0%	4%	4%	7%	7%	11%	0%	7%	0%	4%	11%	0%	4%	100 %

Note: Bold black border= most relevant success factors per FinTech business model archetype; Gray box= most relevant success factors per dimension; no literature was found for the business model archetypes “Financial markets intermediary” and “Information extractor”

Figure 16. Relative frequencies of identified success factors for FinTech archetypes (Werth et al., 2023, accepted for publication)

Results were validated with real-world-examples from the FinTech industry. Also, two interviews with individuals from the FinTech ecosystem were conducted against the usefulness of the results, which is recommended by Kundisch et al. (2021). The paper provides a conceptual structure and terminology for FinTech success factors in different archetypes. It provides a structured content-based analysis of industry-specific success factors, as suggested by Eickhoff (2017). However, further research should evaluate and compare the success factors identified with more companies and investigate possible failure factors of FinTechs (Werth et al., 2023, accepted for publication). Also, further qualitative expert interviews can be valuable in verifying the identified success factors.

4.3. Implementations of Technologies in the Financial Services Sector

Two studies investigated banks and insurance companies with a specific look at technologies, their implementations, and possible chances and challenges associated with these. Rodríguez-Cardona et al. (2019) survey critical success factors of implementing chatbot technology within the insurance industry in Germany. Their mixed-methods design enriches the academic understanding that insurers must be aware of the relative advantages of using these technologies. Furthermore, the technologic infrastructure is perceived as the most critical factor for the adoption and diffusion of chatbot technology and must be considered by practitioners.

Another case study is performed by Eden et al. (2022). Their in-depth case-studies within two financial services providers identified 13 factors influencing advisory work when technological innovations in front-offices, i.e., mobile apps and a video-tools, are introduced. They derived three meaningful propositions and influences on implementing digital advisory work regarding the environment, the organization, and technologies. The following figure depicts the relationships according to the Technology-Organization-Environment-Framework by DePietro et al. (1990).

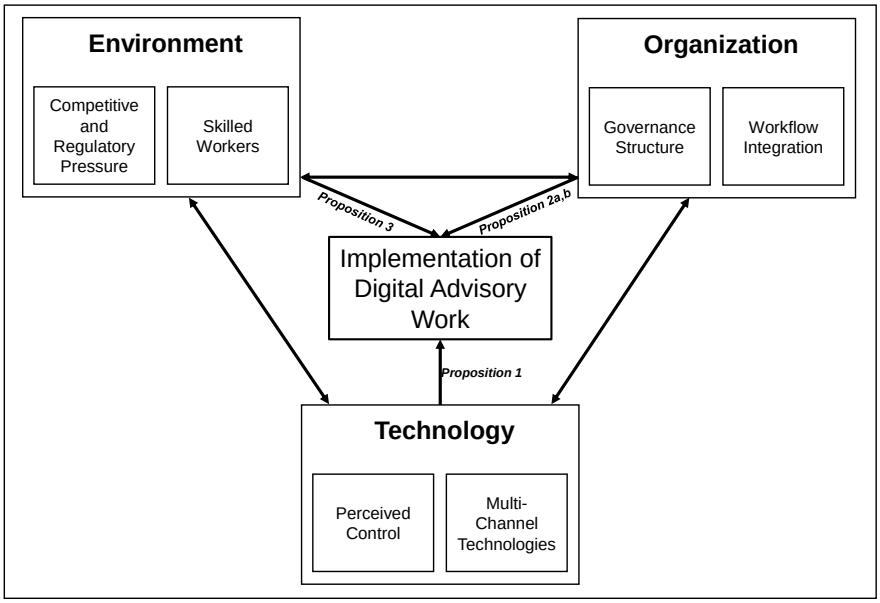

Figure 17. Adapted technology-organization-environment framework with results from Eden et al. (2022, p. 18)

The adoption of digital technologies in advisory work significantly impacts perceived control and the visibility of the workflows for all involved people (Proposition 1). Also, governance structures and a digital connection of back- and front-office workflows impact the implementation of technologies for advisory work (Proposition 2a and 2b). However, the environment of financial services providers influences the adaptation and implementation of technologies, e.g., regulatory pressure and the lack of skilled workers (Proposition 3) (Eden et al., 2022). From an academic perspective, the paper sheds light on the chances and challenges associated with such implementations and enriches the theoretical understanding concerning technological implementations within financial services providers. Practitioners should evaluate their introductions of technologies along technical, organizational, and environmental factors. It must be noted that data collection took place before the COVID-19 pandemic. Therefore, it can be valuable to investigate whether the implementation's survival was successful.

A more detailed examination of mobile apps that can be seen as an important enablers for new value creation in the financial services sector comes from Torno et al. (2021). With a taxonomic approach of over 170 mobile personal finance apps, they identified twelve dimensions linked to a technical and financial services perspective. Furthermore, they identified ten distinct archetypes of services provided through cluster analysis. For example, they identified clusters such as transaction authorization, advanced budgeting, and credit card and retail payment. Their title indicates that the personal finance mobile app market provides more services than mobile banking services. Academics can use this taxonomy for theory-building purposes and detailed investigation of separate elements of the investigated apps. On the other hand, practitioners can use the results to see what the competition is doing and advance their services provided. However, their examination lacks a third-party evaluation regarding usefulness and appropriateness.

The financial services sector and the usage of (new) technologies within the involved companies is an important field of research. While the publications pre-

sented in this dissertation carved out mainly influencing and critical success factors for implementations and (long-term) survival in the financial market, several FRDs arise that will be discussed later in the further research section.

5. Part E: Digital Transformation in Further Business Areas

5.1. Digital Transformation in Urban Mobility

This dissertation will discuss five published publications in this subsection that investigated DT in different business areas besides the already examined energy and financial services sector. Furthermore, a completed research paper, accepted for publication, investigates AI-based cybersecurity solutions (Gerlach et al., 2022).

Two of these paper deal with the technology acceptance of ridepooling providers (Sonneberg et al., 2019; Werth et al., 2021). Both studies investigate ridepooling services from a customer's perspective though quantitative survey-based research. The survey of Sonneberg et al. (2019) was, on the date of publication, the first that investigated ridepooling services from a technology acceptance perspective. Ridepooling or Shared Ridehailing can be defined as a new mobility service where users hail a shuttle to designated (virtual) pick-up points near their location through their mobile phones and apps. Customers with similar routes are matched and transported in the same vehicle (Clewlow & Mishra, 2017). (Potential) customers must accept these new services and their underlying technologies, e.g., the app needed to fulfill the booking process. In the paper of Sonneberg et al. (2019), the TAM was used to predict critical acceptance factors towards such services. Their investigation reveals that perceived compatibility was identified as the strongest predictor, while perceived ease of use (PEOU) and perceived safety (PS) are not relevant for accepting ridepooling. The examination carved out the first set of acceptance factors. However, other acceptance theories in ISR are available and can be used.

Consequentially, the paper of Werth et al. (2021) continues this research and tested and uses constructs from the Unified Theory of Acceptance and Use of Technology 2 (UTAUT2) as presented by Venkatesh et al. (2012). With a survey-based procedure, they collected 224 respondents from (potential) ridepooling customers to derive potential influencing factors for the behavioral intention (BI) to use ridepooling services. The results can be seen in the following figure (Notes: *p < 0.1; **p < 0.01; ***p < 0.001; dotted line represent insignificant paths):

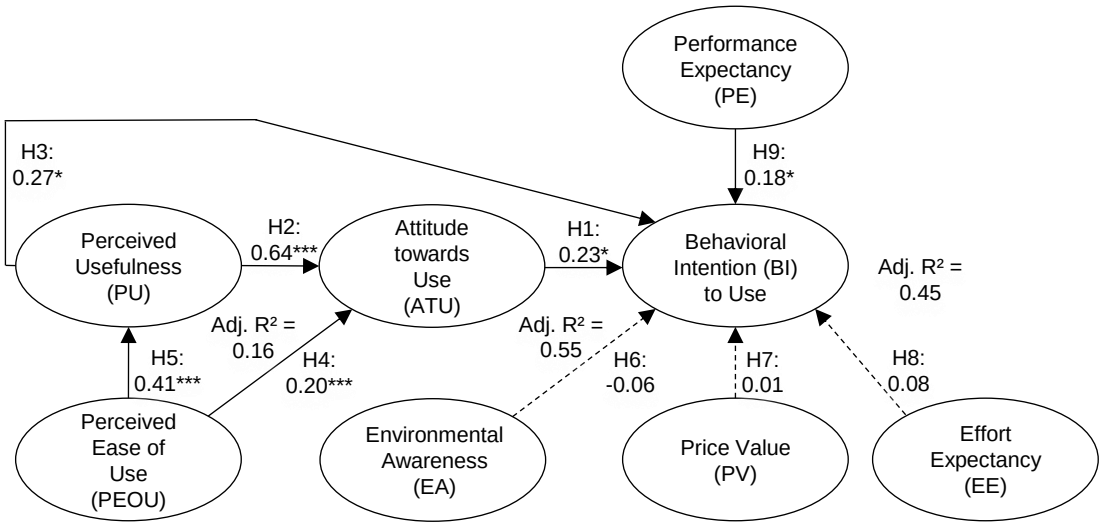

Figure 18. Results and findings of the bootstrapping analysis for the structural model according to Werth et al. (2021, p. 1317)

Following UTAUT2, they tested environmental awareness (EA) and effort expectancy (EE) towards behavioral intention (BI) to use ridepooling services. In their examination, attitudes towards usage (ATU), perceived usefulness (PU), and performance expectancy (PE) have a positive influence, while EA, price value (PV), and EE do not have an impact on the acceptance, i.e., BI to use, on ridepooling services. From a theoretical point of view, the paper was the first investigation that was able to compare new empirical data with a comparable one, namely the one of Sonneberg et al. (2019). Such comparisons can identify patterns of factors critical for ridepooling services. Ridepooling companies can use the results towards tailored marketing activities based on the identified acceptance factors (Werth et al., 2021).

5.2. Digital Transformation in the Service Sector

Not only mobile apps can enable changes within value creation. Also, IoT is a possible enabler for new possibilities of value propositions (Vial, 2019). Generally, IoT refers to the networked connections of objects, e.g., manufacturing machines. Furthermore, these objects are often equipped with intelligence, e.g., through sensors (Xia, Yang, Wang, & Vinel, 2012). Intelligence can be used for smart services that can enable new business models. Smart services can be defined as “individual, highly dynamic and quality-based service solutions that are

convenient for the customer, realized with field intelligence and analyses of technology, environment and social context data (partially in real-time), resulting in co-creating value between the customer and the provider in all phases from the strategic development to the improvement of a smart service" (Dreyer, Olivotti, Lebek, & Breitner, 2019, p. 57). However, the appropriate offering of smart services and the usage of knowledge generated through smart services call for an efficient knowledge management system (KMS). The investigation of Dreyer et al. (2021) examined ten DPs through a comprehensive literature review of 157 scientific papers, and can be found in the following table:

Smart Service KMS Requirement	DP Number	DP for Smart Service KMS
It is usable in value networks	**DP1**	The Smart Service KMS must be designed for usage across different companies connected in a value network.
It is usable by both people and machines	**DP2**	The Smart Service KMS must be standardized designed to be understandable both by people and machines.
It generates knowledge automatically	**DP3**	The Smart Service KMS must be designed as a living IS. New knowledge from operating smart services must be integrated automatically, and information must be combined to generate knowledge.
It is able to work in different contexts	**DP4**	Since smart services can be implemented differently in different companies, the Smart Service KMS must be designed for application in different contexts.
It is able to give situation-sensitive output	**DP5**	The Smart Service KMS must be able to give individual output to the current situation.
It generalizes specific context information	**DP6**	The Smart Service KMS must generalize specific knowledge gained during smart service application for future use in other contexts.
It reacts in real-time	**DP7**	For smart services, reaction in real-time is often necessary, therefore the Smart Service KMS must enable and support that through its structure and mechanisms.
It provides role-based authentication	**DP8**	Measures such as role-based authentication address security and privacy concerns; concepts and strategies for remote access in the Smart Service KMS are inevitable and must be considered.
It provides appropriate interfaces	**DP9**	The Smart Service KMS must be connectable to other IS and tools with appropriate interfaces.
It is capable of being integrated into a middleware	**DP10**	The Smart Service KMS must be embedded adequately in existing IS and processes. Data lakes can be used to collect data from various data sources.

Table 5. Requirements and design principles for smart service KMS by Dreyer et al. (2021, pp. 42–43)

The requirements identified are diverse and range from an automatic generation of knowledge to providing an appropriate interface. However, with this literature-based approach, a holistic view of what is crucial for developing a Smart Service knowledge management system (Smart Service KMS) could be derived. The journal paper enriches the understanding of KMS tailored for the domain of smart services, e.g., identified as an FRD by Dreyer et al. (2019). From an academic

point of view, it enhances the understanding of crucial requirements of KMS for smart services. Practitioners can use it as guidance for implementation projects of Smart Service KMS in companies. However, while identifying DPs from the literature, the paper lacks an evaluation of third parties. As DPs should be useful and applicable in practice (Gregor, Kruse, & Seidel, 2020; Kruse, Purao, & Seidel, 2022), an evaluation is an eminent next step for further research.

5.3. Digital Transformation in the Health Sector

DT also influences the health sector. While the future of health care becomes more patient-centric, it is inevitable to use and adapt new technologies by intended stakeholders like therapists or patients. Depression is a major concern for people and society, accelerated through the COVID-19 pandemic. However, therapy for depression is difficult, and waiting times for professional psychotherapy are long, e.g., in Germany (Müller et al., 2022). Mobile apps can help to increase the supply of depression therapy either self-guided by the intended user or guided by a professional therapist (Cuijpers, Noma, Karyotaki, Cipriani, & Furukawa, 2019). However, the market is fragmented and difficult to observe by its intended users and involved stakeholders. The paper of Mueller et al. (2022) investigated (mobile and web) apps for depression in a taxonomic manner. Following the methodologies for taxonomy development by Nickerson et al. (2013) and Kundisch et al. (2021), they identified eleven dimensions and 46 connected characteristics among 55 distinct apps for depression. They identified six main purposes of these apps, e.g., psychoeducation and medical assessments. Also, for example, tailoring features and used media types are divers. The taxonomy is depicted in the following table:

Dimension	Characteristics							
Main Purpose	Psychoeducation (13)	Medical Assessment (7)	Symptom Management (4)	Supportive Resources (2)	Therapeutic Treatment (7)	Multiple Purposes (22)		
Media Type	Audio only (1)	Text only (11)	Visual (7)	Multimedia (36)				
Data Collection	Yes, Only Usage Data (13)	Yes, Usage and Personal Data (36)	None (6)					
Sharing of Information	App Provider Only (19)	App Provider and Service Providers (25)	Other Third-Party Providers (11)					
Tailoring Features	Interface Customization (7)	Treatment-oriented Customization (2)	App-driven Tailoring (1)	Mood-driven Tailoring (4)	Customization of Push Notifications (12)	Multiple (16)	None (13)	
Support	Information on External Support (18)	Direct Personal Support (8)	Integrated Safety Plan (4)	None (25)				
Information Flow	Informational (4)	Reporting (4)	Interactive (47)					
Certification	Yes (9)	No (46)						
Price Model	Free (23)	Freemium (Subscription) (16)	Freemium (One-time-Payment) (2)	Freemium (Hybrid) (3)	Premium (One-time-Payment) (2)	Premium (One-time-Payment, Refundable) (5)	Premium (Subscription, Refundable) (2)	On Prescription (2)
Operating System	Mobile (37)	Web (6)	Both (12)					
Therapeutic Assistance	Independent (41)	Therapist Contact Possible (6)	Compulsory Assistance (8)					

Table 6. Final taxonomy with the number of occurrences for each characteristic by Mueller et al. (2022, p. 5)

Also, they evaluated and identified six clusters of app configurations through cluster analysis. Here, clusters like “mobile symptom management and self-monitoring” or “refundable online therapies” were identified by the authors. Their examination sheds light on the market for apps for depression and leaves an overview of the functionalities of these apps for app developers and interested stakeholders. However, apps for depression have been previously reviewed by researchers, e.g., Marshall et al. (2019) or Stawarz et al. (2018). In contrast, the research by Mueller et al. (2022) derives six distinct archetypes from a taxonomy to examine the differences and similarities that those apps offer to their users. Practitioners can use the information provided as a market overview and observe what other apps offer. While the information provided by the taxonomy is evaluated

through the cluster analysis, a limitation is a missing evaluation of its usefulness of the results by third-parties, e.g., developers and psychotherapists.

5.4. Digital Transformation and Cybersecurity

Businesses generate positive impacts through digital technologies, such as mobile apps or IoT. However, as proposed and identified by Vial (2019), DT has negative impacts, such as security and privacy concerns. Several businesses are offering AI-based cybersecurity solutions against this backdrop, i.e., a rising threat of becoming a cybercrime victim. The usage and inclusion of new analytical methods with AI open the door for more efficient localizations of cybercrime activities within critical (cyber) infrastructures. The completed research paper by Gerlach et al. (2022) focused on these businesses, examining their crucial business model elements using the taxonomic approach proposed by Nickerson et al. (2013). This methodology identified 13 dimensions and 58 characteristics among 229 services. In summary, the analysis reveals that AI-based cybersecurity is mainly offered for businesses and their internal systems, protect third-party cyber risks, and provide automated and manual response strategies by its customers. Their analysis of these 229 real-world services reveals four distinct AI-driven cybersecurity businesses, e.g., “intrusion detection and resilience-enhancing cybersecurity services” and “all-in-one solutions.” In addition to the already discussed taxonomy paper in this dissertation, Gerlach et al. (2022) developed DETRAICS, a **de**cision **tr**ee for **AI**-driven **c**ybersecurity **s**ervices, as depicted in the figure below. It supports involved stakeholders interested in AI-based cybersecurity, e.g., consultants, to answer four intuitive questions to identify the most suitable cybersecurity solution according to the presented archetypes. While a taxonomy and clusters can be seen as academic for practitioners, they can use DETRAICS to select the most suitable AI-driven service for their needs. Also, Gerlach et al. (2022) evaluated their results with expert interviews. Their qualitative examination reveals the usefulness of DETRAICS and the provided taxonomy and archetypes. The information provided can be used as a knowledge background and, in parts, as decision support, for interested individuals. However, there is still room for improvement regarding the completeness of dimensions and characteristics within the taxonomy. Also, missing dimensions and

characteristics influence the identification of archetypes and, in the end, the decision tree. However, their examination lacks a broader evaluation with third-parties who use DETRAICS and implement AI-based cybersecurity in their own (business or private) environment.

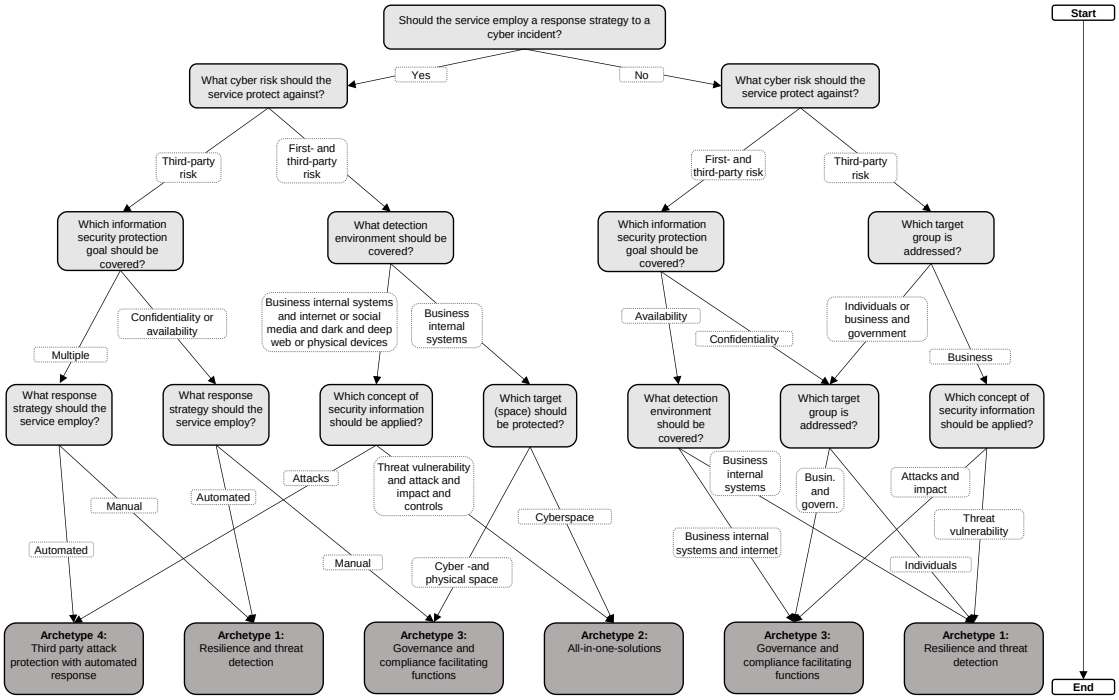

Figure 19. Decision tree for AI-driven cybersecurity, according to Gerlach et al. (2022, p. 11)

6. Part F: Critical Appraisal, Further Research Agenda, and Concluding Remarks

The following section critically reflects the paper's contributions and limitations. It proposes thirteen FRDs and how interested researchers can solve these directions with exemplary methodologies. Therefore, a further research agenda is presented to receive an intuitive overview of research directions. The research agenda is structured along Parts B to E and this dissertation's corresponding subsections (2.1. to 5.3).

Within the topic of mobile app development, two main FRDs arise. **FRD 2.1.** focuses on the examination of critical success factors for specific mobile app domains. The paper of Werth et al. (2019) examines and structures different process models for mobile app development. However, they took a holistic view of the development process. Further research should focus on possible critical success factors in different app domains, e.g., mobile finance, and examine how they are related and interconnected to the development process and/or the selection of process models. This can be done, e.g., with a review of literature or mobile apps in well-known App Stores and structured with a taxonomic approach (Nickerson et al., 2013). More tailored knowledge about different app domains can leverage the understanding of critical aspects of app development for developers or academics. At the same time, the paper by Werth et al. (Working paper) advances previous research by Werth et al. (2019) providing a reference model for mobile app development. However, this lays the foundation for **FRD 2.2.,** the evaluation of the reference model with third parties, e.g., with mobile app developers or chief executives. The reference model REMOB is a blueprint and abstraction in general for mobile app development. However, it must be checked and tailored for the individual, organizational purposes, and general conditions. Evaluation of reference models is a demanding task but can lead to meaningful reference models that, e.g., provide cost-savings for practitioners and manage risks. On the other hand, academics can iterate REMOB, e.g., with results from the evaluation towards more tailored process models in specific mobile app domains. In any case, the evaluation must include the different views of relevant stakeholders in the mobile app development process. Qualitative, i.e., checklists for possible interviews (Frank, 2006), or quantitative, i.e., measurement instruments (Matook & Indulska, 2009), guidelines for efficient reference evaluation can be found in the literature.

Regarding the paper of Werth et al. (2022b), two subsequent FRDs (**3.1.** and **3.2.**) arise that are strongly interconnected. First (**FRD 3.1.**), their investigation lacks the incorporation of citizens' opinions for the planned R&D platform. Citizens are an important stakeholder group in energy transition and should be included in the development process (Pons-Seres de Brauwer & Cohen, 2020). The planned R&D platform and its planned functions can then be tailored to the needs of this stakeholder group. **FRD 3.2.** comes up intuitively. As part of requirements engineering, a system's development and deployment, e.g., through a web page, is necessary (Nuseibeh & Easterbrook, 2000). Therefore, implementing an open-source energy research platform with an evaluation is left for further research inquiries. After a prototype is developed, it should be carefully evaluated with its intended stakeholders and iteratively enhanced to achieve long-time survival in the energy research community. This can be done, e.g., with focus-group interviews. A third FRD arises from the publications of DT in the energy sector. As **FRD 3.3.** proposes further examinations of the usefulness and success of SH applications, this could be a practical approach for further research. Werth et al. (2020a) found that the usefulness and usability of SH in the private context were somewhat under-researched. Further research can investigate these concepts in light of SH in a personal context, e.g., through quantitative survey-based analysis with potential end-users. Research in this direction can create meaningful knowledge for practitioners to make marketing activities or communication towards potential customers to SH technologies in the private context more efficient. Literature on the topic of SH is, of course, raising. As a supplement, researchers should also include the findings and concepts of the most recent literature on possible barriers to the usage of SH technologies, e.g., with the conceptual framework proposed by Li et al. (2021).

FRD 4.1., 4.2., and **4.3.** arise from the publications in this dissertation that deal with DT in the financial services sector. In **FRD 4.1.,** in-depth investigations and comparisons of technological implementations at financial services providers are provided as potentials for further examinations. The paper of Eden et al. (2022) examines two specific implementations in the front offices of financial services providers. Truly, DT does not happen only in the front-offices of financial services providers. Following the logic of Vial (2019), DT can also occur in organizations

as a whole, e.g., in the back-offices or new working methods are introduced. Therefore, negative and positive impacts should be investigated with regards to other implementations than front-offices with case study research (Yin, 2018). Further research can compare the findings contained in this dissertation with other implementations. Furthermore, cross-sectoral comparisons can be useful, e.g., with sectors that are also highly influenced by regulations. Such comparisons can lead to meaningful results for academics and practitioners. Werth et al. (2023, accepted for publication) examined success factors for FinTech ventures through taxonomy-based content analysis. While they investigated a bundle of potentially relevant success factors and compared them with real-world examples from the FinTech market and interviews, a long-term perspective on success is missing. Therefore, **FRD 4.2.**, an investigation of long-term survival, success, or failure of FinTech ventures is proposed. Further research can investigate the market of FinTechs from this perspective through business model lifecycle assessments based on previous research (e.g., Muzellec et al. (2015)) or success measurement for criticality (Bhattacharjee & Dey, 2015). This can lead to more detailed knowledge of how success factors are being adapted and implemented for the long-term survival of FinTech ventures. Both can be done on an archetypical level of FinTechs, as proposed by Eickhoff et al. (2017). With the tailored success or failure measurement, the criticality of specific success factors can be determined and further investigated by researchers. Also, practitioners can learn from the importance of several success factors for their businesses or funding activities. But not only the success of FinTech ventures can be investigated further. **FRD 4.3.** deals with the success measurement of technological implementations in the financial services sector. The paper of Eden et al. (2022) examines two specific implementations in the front-offices of financial services providers. However, their investigation and data collection took place at the beginning of the implementations. Statements from included stakeholders were collected, but it remains unclear whether the implementations were successful. Further research can perform in-depth case study research (Yin, 2018) that deals explicitly with the success of such implementations, e.g., technology-supported agile work or automation in back-offices trough technology. The construction of meaningful interview

guidelines can be supported by well-known theories on Information Systems success, like the Information Systems success model by Delone and McLean (2003). Qualitative interviews with individuals in companies, as well as the reading of further company reports or key performance indicator reports, can help here. Triangulation can enhance the understanding of the phenomenon (Denzin, 2012), i.e., the success of implementing specific technologies from an academic point of view. Practitioners could investigate and see what the sector is doing and use it for their implementation projects.

From the publication on DT in other business areas, three main FRDs arise. Two publications in this dissertation deal with the acceptance of ridepooling services (Sonneberg et al., 2019; Werth et al., 2021). However, these investigations can be extended to understand better what ridepooling customers want. Therefore, **FRD 5.1.** is proposed. Here, further research can test acceptance constructs and theories toward ridepooling services. For example, in ridepooling concepts, safety aspects can be crucial for the customers as they drive together with unfamiliar passengers or drivers (Dietrich & Stöffler, 2021). While these aspects play a subordinate role in the contained publications on ridepooling in this dissertation, further research can examine safety acceptance factors in more detail. Survey-based research with underlying mobility theories, e.g., the Safety-Critical TAM by Hutchins et al. (2019), can serve as a starting point for this. This can be valuable for a better academic understanding of urban mobility safety aspects and help practitioners offer their services more conveniently to customers.

Dreyer et al. (2021) examined ten DP for KMS through an extensive review of approximately 130 papers. DP, in general, is an output of DSR that aims to construct problem-solving artifacts for relevant stakeholders. Therefore, **FRD 5.2.** is built so that the DP for KMS for smart services must be implemented and evaluated. While the DPs are articulated understandably by Dreyer et al. (2021), they can be enhanced through a more detailed formulation of the DP as proposed by recent literature on DP, e.g., Gregor et al. (2020). Those DP should be first evaluated through interviews with interested individuals and iteratively improved. As a result, constructing KMS for smart services in a real-world setting is a valuable way to evaluate the DP's meaningfulness, complexity, and understandability.

Practitioners could learn from carefully tested and assessed DP how to build KMS for smart services for their institutional settings in the manufacturing industry or elsewhere.

Some papers presented in this dissertation used the taxonomic process by Nickerson et al. (2013) as an underlying methodological concept, e.g., Werth et al. (2019). As a result of these papers, taxonomies are DSR artifacts that must be evaluated by their usefulness and applicability in reality (Kundisch et al., 2021; Szopinksi, Schoormann, & Kundisch, 2019). Generally, the evaluation of taxonomies can happen *ex-ante* (during the development process (Nickerson et al., 2013)) or *ex-post* after the development (Kundisch et al., 2021). While the taxonomies presented in this dissertation are already published or under review, I focus the FRD on *ex-post* evaluation. Based on these statements, *ex-post* evaluation plays an important role at **FRD 3.4.**, **FRD 5.3.**, and **FRD 5.4.**. In any case, appropriate evaluation criteria must be defined, and evaluation methods need to be chosen (Prat, Comyn-Wattiau, & Akoka, 2015). Here, Kundisch et al. (2021, p. 12) proposed that "answering the 'why,' 'how,' and 'what' of evaluation" is a suitable way for an evaluation strategy. Furthermore, answering these questions can help construct reliable interview guidelines for interview situations with relevant stakeholders. To summarize, researchers interested in conducting evaluations based on **FRD 3.4.** and **FRD 5.3.** are encouraged to determine applicable evaluation criteria and the specific target group of the taxonomy, clusters, or decision trees, respectively. For example, in the completed research paper by Mueller et al. (2022), a taxonomy and archetypes of apps for depression are presented. Interviews in light of the beforementioned questions with relevant stakeholders, e.g., (mobile) app developers from the health sector, could be valuable for evaluation.

Gerlach et al. (2022) constructed a decision tree for AI-based cybersecurity solutions. However, the construction is based on a taxonomy, its associated dimensions, characteristics, and clustering. It can be concluded that they evaluate their taxonomy through the conduction of clustering *ex-ante* (Kundisch et al., 2021). An evaluation of the clustering and an evaluation by third-parties is missing. Con-

sequently, **FRD 5.4.**, an evaluation of the usefulness and applicability of DETRAICS, is presented. Decision trees, in general, should have a clear, practical value (Magee, 1964). Therefore, it is inevitable to check whether DETRAICS is useful or comprehensible for practitioners in a broader context. Here, a qualitative approach can be valuable, e.g., through conducting interviews regarding decision support with more experts from the cybersecurity area. Also, possible implementations with DETRAICS as a decision support component should be evaluated regarding the usefulness of the decision tree.

The research agenda based on the FRDs before is presented in the following table:

Part / Topic	**Further Research Direction**	**Possible Methodology and Procedure**
B: Mobile Application Development	2.1. Examination of critical success factors for specific mobile app domains	Taxonomy building or comprehensive literature review
	2.2. Evaluation of the reference model with third parties, e.g., mobile app developers	Qualitative interviews
C: Digital Transformation in the Energy Sector	3.1. Examination of opinions of citizens for the planned R&D platform	Requirements engineering, Focus group discussions with stakeholders
	3.2. Implementation of an open-source energy research platform and evaluation	
	3.3. Further examinations of the usefulness and success of SH applications	Quantitative survey-based research with (potential) end-users
	3.4. Evaluation of the usefulness and applicability of the taxonomies and archetypes	Qualitative interviews with stakeholders
D: Digital Transformation in the Financial Services Sector	4.1. In-depth investigations and comparisons of technological implementations at financial services providers	Case study research
	4.2. Investigation of long-term survival, success, or failure of FinTech ventures	Success measurement, Business model lifecycle assessment
	4.3. Success measurement of technological implementations in the financial services sector	Case study research, Qualitative examinations

Part / Topic	Further Research Direction	Possible Methodology and Procedure
E: Digital Transformation in further Business Areas	5.1. Testing of further acceptance constructs and theories toward ridepooling services	Quantitative survey-based research with (potential) customers
	5.2. DPs for KMS for smart services must be implemented and evaluated	Expert consultation and implementation of a KMS for smart services within a case study
	5.3. Evaluation of the usefulness and applicability of the taxonomy and archetypes	Qualitative interviews
	5.4. Evaluation of the usefulness and applicability of DETRAICS in a broader context	Qualitative interviews, Case studies (decision of AI-driven cybersecurity with DETRAICS)

Table 7. Further research agenda for mobile application development and digital transformation

This dissertation contained papers dealing with mobile app development and DT in several business areas, e.g., the financial services or the energy sector. The first two papers investigated process models for mobile app development, chances and challenges associated with their (non-)usage, and transformed them into a reference model. The other publications investigated the phenomenon of DT, with or without a focus on a specific technology, like mobile apps or AI. With this dissertation, academic contributions on the individual level, e.g., critical acceptance factors, or the institutional level, e.g., archetypes, are derived. Practitioners can use the implications from the publication derived for a deeper insight into crucial factors that are important to consider, for example, in the implementation phases of new technologies. Based on a critical appraisal of the contained publications, the dissertation lays a meaningful further research agenda for important phenomena in ISR, i.e., mobile apps and DT. It can serve as a starting point for an ongoing discussion and tailored research on the consistently changing environment in business areas.

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Appendices

Appendix A1: Make or Break: Business Model Determinants of FinTech Venture Success

Authors: Jan Roeder, Davinia Rodríguez Cardona, Matthias Palmer, Oliver Werth, Jan Muntermann, Michael H. Breitner

Outlet: Proceedings of the Multikonferenz Wirtschaftsinformatik, 2018, 10 p., Lüneburg, Germany

Link: https://www.researchgate.net/profile/Oliver-Werth/publication/327230868_Make_or_Break_Business_Model_Determinants_of_FinTech_Venture_Success/links/5cac528a92851c64bd59f54c/Make-or-Break-Business-Model-Determinants-of-FinTech-Venture-Success.pdf

Abstract: In recent years, the phenomenon of rapidly proliferating FinTech companies along diverse segments of the financial services value chain has attracted considerable interest in academic research and practice. So far, various factors of FinTech venture success have been explored, but there is little empirical insight through the lens of business model theory. To close this gap, we build on a FinTech business model taxonomy and examine 221 FinTech companies in order to statistically infer crucial business model determinants responsible for FinTech venture success. Our findings show that the business model component “Product/Service Offering” is the most important determinant for the success of a FinTech venture.

Keywords: FinTech, Business Model, Venture Success, Taxonomy.

Appendix A2: Successful Mobile Application Development: Towards a Taxonomy of Domain-Specific Process Models and Methodologies

Authors: Oliver Werth, Nadine Guhr, Michael H. Breitner

Outlet: Proceedings of the 52nd Hawaii International Conference on System Sciences, 2019, 10 p., Maui, Hawaii, U.S.A.

Link: https://aisel.aisnet.org/hicss-52/st/mobile_app_development/8/

Abstract: Mobile applications and mobile application development issues receive an increasing attention for practitioners and academics. The development of mobile applications is connected with a number of domain-specific issues and challenges (e.g., fulfilment of customer requirements or the prevention of high development costs). Consequently, the decision of the most effective process model to develop a mobile application plays a crucial role for software and mobile application development teams. With the help of a structured taxonomy-building methodology, we contribute to the extant literature by creating and presenting a taxonomy for process models and methodologies in software engineering and the mobile application development domain. The taxonomy enriches the existing knowledge base and can help mobile application developers to choose the most suitable process model or methodology. Based on our examination, our results indicate new directions for mobile application research and implications for mobile application development.

Appendix A3: Challenges of the Financial Industry - An Analysis of Critical Success Factors for FinTechs

Authors: Oliver Werth, Davinia Rodríguez Cardona, Jan Nowatschin, Matthias Werner, Nadine Guhr, Michael H. Breitner

Outlet: Proceedings of the 25th Americas Conference on Information Systems, 2019, 10 p., Cancun, Mexico

Link: https://aisel.aisnet.org/amcis2019/ebusiness/ebusiness/4/

Abstract: FinTechs are attracting ongoing interest in both academia and practice. With the use of techniques borrowed from grounded theory, we analyze material from 10 interviews with managers and Chief Executive Officers at FinTechs and 8 interviews with venture capitalists (VCs). We examined 15 critical success factors (CSFs) for FinTech ventures. These are divided into 9 factors that generally apply to general ventures: (1) team, (2) entrepreneur, (3) capital, (4) product/market fit, (5) idea and execution, (6) pivoting and continuous learning, (7) customer acquisition, (8) internationalization, and (9) networking. In addition, we examine 6 factors that have specific relevance to FinTech venture success, namely, (10) technological advantage, (11) regulatory knowledge, (12) B2B focus, (13) incumbent partnerships, (14) growth potential, and (15) exit options for VCs. Our study expands the literature on CSFs for FinTechs and provides recommendations for entrepreneurs to be more successful.

Keywords: FinTechs, Critical Success Factors, Grounded Theory, Venture Capital Success.

Appendix A4: A Mixed Methods Analysis of the Adoption and Diffusion of Chatbot Technology in the German Insurance Sector

Authors: Davinia Rodríguez Cardona, Oliver Werth, Svenja Schönborn, Michael H. Breitner

Outlet: Proceedings of the 25th Americas Conference on Information Systems, 2019, 10 p., Cancun, Mexico

Link: https://aisel.aisnet.org/amcis2019/adoption_diffusion_IT/adoption_diffusion_IT/18/

Abstract: In recent years, gradual improvements in information, computing, communication and connectivity technologies have enabled new technical possibilities for the adoption of Chatbots across diverse sectors. In the case of the insurance sector, the implementation of service innovations based on Chatbot technology can contribute, among other benefits, to improve the efficiency across the insurance value chain, reduce costs and generate customer loyalty and trust (Barrett et al., 2015; Ross et al., 2016). However, despite the advantages, the adoption success of Chatbot Technology depends on the understanding of the ambivalent perceptions, attitudes, and beliefs of the main social actors (i.e. practitioners and potential users) towards the customer interface. Using a mixed methods design based on an interpretive paradigm and within the frameworks of acceptance and diffusion research, we identified the “relative advantages” and “IS infrastructure” as the most critical ambivalent socio-technical factors for the adoption and diffusion of Chatbot technology in Germany.

Keywords: Acceptance and Diffusion Research, Ambivalent IT, Technology, Organization, Environment (TOE) Model.

Appendix A5: Privacy Concerns in the Smart Home Context

Authors: Nadine Guhr, Oliver Werth, Philip Peter Hermann Blacha, Michael H. Breitner

Outlet: SN Applied Sciences, 2020, Issue 2, Article 247, 12 p.

Link: https://doi.org/10.1007/s42452-020-2025-8

Abstract: With the rapid development of the Internet of Things, intelligent systems are increasingly finding their way into everyday life and into people's homes. With the spread of these technologies, there is a growing concern about what sensitive data is collected and what it is used for. Unfortunately, the role of privacy has remained largely unexplored in the smart home (SH) usage context. This study addresses this gap in literature: to what extend users' concerns for information privacy influence the intended SH usage. This study takes an interactional psychology perspective and links the dimensions of the privacy concerns to the intention to use SH devices. Therefore, a multi-theoretical model using Smart PLS 3.2.8 was tested. This study contributes to the literature on privacy, and SH usage by exploring how and why privacy concerns influence participants' intended SH usage. The findings, derived from the empirical study emphasize the importance of addressing privacy concerns because they are capable of directly and indirectly influencing the intended SH usage. Finally, the results which indicate new directions for privacy and SH research are discussed and implications for research and practice are given.

Keywords: Privacy Concerns, Smart Home Technologies, Technology Acceptance, Theory of Planned Behavior, Structural Equation Modelling.

Appendix A6: An Empirical Study of Customers' Behavioral Intention to Use Ridepooling Services–An Extension of the Technology Acceptance Model

Authors: Marc-Oliver Sonneberg, Oliver Werth, Max Leyerer, Wiebke Wille, Marvin Jarlik, Michael H. Breitner

Outlet: Proceedings of the 14th International Conference on Wirtschaftsinformatik, 2020, 15 p., Siegen, Germany

Link: https://aisel.aisnet.org/wi2019/track02/paper/1/

Abstract: Shared mobility services for passenger transportation become increasingly popular all over the world. As services like carsharing are already well-established and well-accepted, ridepooling services are at their early stage and currently within first implementations. The most critical success factor of such services is the customer acceptance. We investigate the acceptance of 115 German questionnaire respondents using and extending the Technology Acceptance Model. Results indicate that the success factors of the developed model serve as useful predictors of the behavioral intention to use ridepooling services. Perceived compatibility was identified to have the strongest impact whereas perceived ease of use and perceived safety are not relevant for accepting ridepooling services. Based on these findings, our paper provides management implications and recommendations to improve acceptance and success of ridepooling services in Germany.

Keywords: Ridepooling, Passenger Transportation, Urban Mobility, Technology Acceptance Model, Structural Equation Modeling.

Appendix A7: Smart Home in Private Households: Status Quo, Discussion, and New Insights

Authors: Oliver Werth, Nadine Guhr, Michael H. Breitner

Outlet: International Journal of Service Science, Management, Engineering, and Technology, 2020, Volume 11, Issue 4, 15 p.

Link: https://doi.org/10.4018/IJSSMET.2020100108

Abstract: The growing digital transformation creates new ways of living. In recent years, intelligent smart homes (SHs) have increased rapidly. The article gives a status quo overview of the SH literature with regard to the interactions between SHs and their end-users and structures the literature into three categories (SH systems, SH application areas, and SH end-users) and 15 corresponding concepts. The analysis implies that SH is a broad and relevant research topic with different subjects, research gaps, and emerging benefits but also with challenges for all the players in the SH market. SH success depends on many critical success factors (CSF), such as acceptance of usability or interface design. Implications for research and practice to meet these challenges are presented. Several future research directions are suggested.

Keywords: Critical Success Factors, Human Machine Interaction, Literature Review, Private Households, Research Agenda, Smart Home.

Appendix A8: Influencing Factors for the Digital Transformation in the Financial Services Sector

Authors: Oliver Werth, Christoph Schwarzbach, Davinia Rodríguez Cardona, Michael H. Breitner, Johann-Matthias Graf von der Schulenburg

Outlet: German Journal of Risk and Insurance, 2020, Volume 109, Issue 2-4, 25 p.

Link: https://doi.org/10.1007/s12297-020-00486-6

Abstract: Digital transformation affects almost every area in societies and has consequences for incumbent companies. With qualitative research, we explore the influencing factors for digital transformation in the financial services sector. We use a PEST-model and Porter's Five Forces as the underlying structure for our analysis. Our interviews and findings show that the financial services sector face the same current challenges, but their impact is perceived higher in the banking than in the insurance sector concerning social factors and bargaining power of buyers. The character of the current development is evolutionary rather than disruptive. Almost all incumbents currently focus on modernizing and consolidating their backend systems. The aim is to enable them for new customer-oriented services. A primary driver for the digital transformation is the threat of a broader market entry by BigTechs. Our research provides a comprehensive overlook about the influencing factors of digital transformation using statements from experts in the field.

Keywords: Influencing Factors, Digital Transformation, Financial Services Sector, Banks and Insurances, Qualitative Research

Appendix A9: Classification of Real-World Microgrids Based on a Morphological Analysis

Authors: Jana Gerlach, Sarah Eckhoff, Oliver Werth, Tobias Kraschewski, Tim Brauner, Michael H. Breitner

Outlet: Proceedings of the 27th Americas Conference on Information Systems, 2021, 10 p., Montreal, Canada (Online Conference)

Link: https://aisel.aisnet.org/amcis2021/green_IS/sig_green/5/

Abstract: Microgrids integrate distributed energy resources into an energy network reliably and efficiently. However, research of real-world examples at the international level is limited. We conduct a morphological analysis for microgrid design options to examine the status quo of academic literature. We identify 18 dimensions with 60 characteristics divided into the five layers governance, business, intelligence, communication, and physical. Subsequently, we classify 30 real-world microgrids with diverse types and locations using our morphological box. Our analysis reveals future research requirements regarding social aspects, business models, critical success factors, and maturity levels. We provide a framework supporting decision-makers to identify microgrid design options and promote socially, economically, and environmentally sustainable, resilient, and decentralized energy supply.

Keywords: Real-world Microgrids, Morphological Analysis, Classification, Future Research Agenda.

Appendix A10: Examining Customers' Critical Acceptance Factors towards Ridepooling Services

Authors: Oliver Werth, Marc-Oliver Sonneberg, Max Leyerer, Michael H. Breitner

Outlet: Transportation Research Record: Journal of the Transportation Research Board, 2021, Volume 2675, Issue 11, 14 p.

Link: https://doi.org/10.1177/03611981211026304

Abstract: Ridepooling is a new mobility service mainly for people in cities and urban areas. By matching the routes of customers with similar start and end points while driving in an optimally pooled manner, meaningful reductions in road traffic and related emissions can be achieved. Such services must meet customers' demands appropriately to achieve sustainable customer acceptance. Service providers face diverse customer expectations and prejudices that differ from those toward existing transportation modes. Today, most ridepooling trips are conducted with only one customer, confirming impressions of nonoptimal operation. Using a survey-based approach, possible relevant constructs for the acceptance of and intention to use ridepooling services are analyzed. Testing constructs from the Unified Theory of Acceptance and Use of Technology 2 and environmental awareness, partial least squares analysis was performed with the software SmartPLS to investigate a dataset of 224 respondents. Results suggest that attitude toward use, perceived usefulness, and performance expectancy have an influence on the behavioral intention to use ridepooling services. In contrast, environmental awareness, price value, and effort expectancy do not have such an influence. The study expands the literature about customer acceptance of ridepooling service as well as new mobility services in general. Further, the paper provides research implications and recommendations for the development and implementation of the ridepooling concept for service providers.

Appendix A11: More than Mobile Banking – A Taxonomy-Based Analysis of Mobile Personal Finance Applications

Authors: Albert Torno, Oliver Werth, Robert C. Nickerson, Michael H. Breitner, Jan Muntermann

Outlet: Proceedings of the 25th Pacific Asia Conference on Information Systems, 2021, 14 p., Dubai, U.A.E. (Online Conference)

Link: https://aisel.aisnet.org/pacis2021/179/

Abstract: Mobile personal finance applications cannot only assist users in daily personal finance activities, e.g., mobile banking, but can also guide users to optimize long-term financial decisions. Still, research lacks a rigorous classification of this critical mobile commerce domain. We provide insights by developing a taxonomy and conducting a cluster analysis of mobile personal finance applications. We classify 170 mobile personal finance applications into twelve dimensions, combining a technical artifact perspective with a financial services perspective. Additionally, we empirically identify ten distinct clusters of archetypical application configurations. While we classify the field and give inclinations for future research, financial service providers and application developers can understand their competitors and use our insights to improve their applications. Potential users of these applications can use our findings to select mobile applications to optimize their personal finance endeavors.

Keywords: Personal Finance, Mobile Applications, Mobile Finance, Mobile Commerce, Taxonomy Development, Cluster Analysis, Archetypes.

Appendix A12: Design Principles for Knowledge Management Systems of Smart Services

Authors: Sonja Dreyer, Oliver Werth, Daniel Olivotti, Nadine Guhr, Michael H. Breitner

Outlet: e-Service Journal, 2021, Volume 13, Issue 2, 41 p.

Link: https://doi.org/10.2979/eservicej.13.2.02

Abstract: Smart services have become increasingly important in the last few years. The provision of smart services combined with product portfolios is advantageous because individual contexts of customers who use the products are addressed. While various and frequently changing data are collected and analyzed, specific knowledge is necessary to turn data into valuable information. A knowledge management system (KMS) adapted to requirements of provided smart services is necessary to aggregate, maintain, and provide knowledge. With a comprehensive literature review over 157 paper, we extracted requirements for KMS for smart services (Smart Service KMS). We present ten design principles derived from the requirements focusing on how tailored Smart Service KMS can be designed. We contribute to the theory by providing an overview about crucial requirements of Smart Service KMS. Practitioners can use our design principles to develop efficient Smart Service KMS.

Keywords: Knowledge Management Systems, Smart Services, Smart Service KMS, Design Principles, Design Science Research.

Appendix A13: Requirements for an Open Digital Platform for Interdisciplinary Energy Research and Practice

Authors: Oliver Werth, Stephan Ferenz, Astrid Niesse

Outlet: Proceedings of the 16h International Conference on Wirtschaftsinformatik, 2022, 15 p. Nuremberg, Germany (Online Conference)

Link: https://aisel.aisnet.org/wi2022/sustainable_it/sustainable_it/2/

Abstract: Energy systems are changing rapidly and energy research is fundamental to enable and optimize this change involving academics, practitioners, and the public. Therefore, an open digital platform to share knowledge and experiences is crucial for the energy sector. We identify and discuss requirements from 36 semi-structured interviews with various stakeholders for a platform based on five essential elements. The competence element enables researchers and developers to find suitable partners for their research and practice projects, and the best practices element delivers ideas to structure cooperative energy research. The repository element helps to find available data and frameworks for energy systems' simulation and optimizations. Frameworks and models are coupled by using the simulation element. Last, results and contents from the energy community can be published within the transparency element to reach various interested stakeholders. We discuss implications and recommendations as well as further research directions.

Keywords: Energy Research, Digital Platform, Requirements Engineering, Qualitative Research Methods, Design Science Research.

Appendix A14: Influences of Digital Innovations on Advisory Work in the Financial Services Sector

Authors: Theresa Eden, Oliver Werth, Christoph Schwarzbach, Michael H. Breitner, Johann-Matthias Graf von der Schulenburg

Outlet: Die Unternehmung – Swiss Journal of Business Research and Practice, 2022, 22 p., Volume 76, Issue 1

Link: https://doi.org/10.5771/0042-059X-2022-1-6

Abstract: We explore the background, changes, and challenges of the digital transformation of customer advisory in the financial services sector resulting from the implementation of new technological solutions. In addition, we examine the effects of the adoption of digital innovations on advisory work. Building on insights drawn from a multiple case analysis within two financial services providers and using the Technology-Organization-Environment (TOE) framework as the theoretical basis, our study identifies 13 factors that influence advisory work when technological innovations are introduced. We provide implications for financial services providers with regard to the identified influencing factors. Our results and findings expand the academic knowledge and understanding of the chances and challenges in the context of introducing technological innovations for financial advisory. Practitioners can use our insights for future implementations of technical solutions supporting advisory work.

Keywords: Digital Innovations, Financial Advisory, Financial Services, Sector, TOE Framework, Case Studies, Qualitative Research.

Appendix A15: How is Your Mood Today? - A Taxonomy-based Analysis of Apps for Depression

Authors: Nina S. Müller, Oliver Werth, Claudia M. König, Michael H. Breitner

Outlet: Proceedings of the 29th Americas Conference on Information Systems, 2022, 10 p., Minneapolis, Minnesota, U.S.A.

Link: https://aisel.aisnet.org/amcis2022/sig_health/sig_health/7/

Abstract: Depression is a serious disease that affects partners, families, friends, and societies. Applications for depression therapy support assist users in daily life to cope with depression challenges. While the services provided can be advantageous, the benefits and apps provided in the market can be overwhelming and fragmented for its intended users. A rigorous classification and clustering of this important domain is still missing. We deduce insights examining a taxonomy and conducting a cluster analysis. We classify 55 applications into eleven dimensions and 46 corresponding characteristics. We identify six clusters of archetypical application configurations. Our procedure classifies this application domain and enables directions towards more tailored research for this eHealth and mHealth artefacts. (Potential) users and application developers can use our results and findings to improve their usage and development and select the most suitable application for their medical needs and interests.

Keywords: Depression, Applications, Taxonomy Development, Cluster Analysis, Archetypes

Appendix A16: Artificial Intelligence for Cybersecurity: Towards Taxonomy-based Archetypes and Decision Support

Authors: Jana Gerlach, Oliver Werth, Michael H. Breitner

Outlet: Proceedings of the 43rd International Conference on Information Systems, 2022, 17 p., Copenhagen, Denmark

Link: https://aisel.aisnet.org/icis2022/security/security/10/

Abstract: Cybersecurity is a critical success factor for more resilient companies, organizations, and societies against cyberattacks. Artificial intelligence-driven cybersecurity solutions have the ability to detect and respond to cyber threats and attacks, and other malicious activities. For this purpose, the most important resource is security-relevant data from networks, cloud systems, clients, e-mails, and previous cyberattacks. Artificial intelligence, the key technology, can automatically detect, for example, anomalies and malicious behavior. Consequently, the market for AI-driven cybersecurity solutions is growing significantly. We develop a taxonomy of AI-driven cybersecurity business models by classifying 229 real-world services. Building on that, we derive four distinct archetypes using a cluster analysis toward a comprehensive academic knowledge base of business model elements. To reduce complexity and simplify the results of the taxonomy and archetypes, we propose DETRAICS, a decision tree for AI-driven cybersecurity services. Practitioners, decision-makers, and researchers benefit from DETRAICS to select the most suitable AI-driven service.

Keywords: Artificial Intelligence, AI-driven Cybersecurity, Taxonomy, Archetypes, Decision Tree.

Appendix A17: What Determines FinTech Success? A Taxonomy-Based Analysis of FinTech Success Factors

Authors: Oliver Werth, Davinia Rodríguez Cardona, Albert Torno, Michael H. Breitner, Jan Muntermann

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Abstract: The creation of value in the financial services sector has been fundamentally transformed by digitally born financial technology (FinTech) companies. FinTech companies synthesize information systems with financial services. Given its disruptive power, the FinTech phenomenon has received great attention in academic research, practice, and media. Still, there is limited systematic research providing a structure and holistic view of FinTechs' success. Aiming to enhance the understanding of the factors enabling FinTech success, we classify success factors across extant scientific literature on distinct FinTech business model archetypes. Our analysis reveals that "security, privacy, and transparency," "technology adoption," "user trust" and the "cost-benefit dynamic of the innovation" are crucial factors for FinTech success. In addition, we validate and discuss our findings with real-world examples from the FinTech industry and two interviews with stakeholders from the FinTech ecosystem. Our study contributes to the knowledge of FinTechs by providing a classification system of success factors for practitioners and researchers.

Keywords: FinTech Success Factors, Taxonomy-Based Analysis, FinTech Business Models.

Appendix A18: Holistic B2X Mobile Application Development – A Strategic Reference Model

Authors: Oliver Werth, Nadine Guhr, Michael H. Breitner

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Abstract: Business-to-X (B2X, "X" for business, customer, etc.) mobile applications ("apps") show various mobile-specific chances and challenges that must be addressed in the whole development process. Strategic knowledge about mobile app development models' usage remains restricted, although various process models for B2X app development have been published already. We, therefore, first reviewed available process models for mobile app development with a taxonomy. In addition, 28 expert interviews with various stakeholders involved in typical B2X mobile app development processes were conducted to examine this research-practice knowledge divide. Since hybrid process models are often advantageous for B2X mobile app development, technical back-grounds or communication processes are also crucial. Since no process model can be used unadopted, we theorize mobile-specific characteristics and challenges of app development process models to a reference model generally valuable for management decision support. The findings create avenues for better theorizing toward successful B2X mobile app development.

Keywords: B2X Mobile Applications, Strategic Development Support, Taxonomy, Expert Interviews, Reference Model